Ministry of Education and Science of the Republic of Kazakhstan
NJSC «Karaganda University named after Academician E.A.Buketov»

«Agreed»
Director of Quality
«Karaganda Pharmaceutical Complex» LLP
Kanaguzova B.M.
"04" 05 2022

«APPROVED BY»
Chairman of the Management Board - Rector
Karaganda University named
after Academician E.A.Buketov
N.O. Dulatbekov
"16" 05 2022.

EDUCATIONAL PROGRAM

«7M05102 - Biotechnology»
Level: Magistracy

Karaganda, 2022

The educational program "7M05102 - Biotechnology" was developed on the basis of:

- Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education"
- Law of the Republic of Kazakhstan No. 151-I of July 11, 1997. "About languages in the Republic of Kazakhstan"
- State mandatory standard of postgraduate education of education dated October 31, 2018 No. 604
- The National Qualifications Framework of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.
- Order of the Ministry of Education and Science of the Republic of Kazakhstan "On approval of the Rules for the organization of the educational process on credit technology" dated October 2, 2018 No. 152
- Classifier of training areas with higher and postgraduate education dated October 13, 2018 No. 569.

Table of Contents

1. Passport of the educational program

1. Code and name of the educational program: "7M05102 - Biotechnology"
2. Code and classification of the field of education, areas of training: 7M05 - Natural sciences, mathematics and statistics, 7M051 Biological and related sciences
3. Group of educational programs: "7M082 - Biotechnology"
4. Volume of credits: 120
5. Form of study: full-time
6. Language of instruction: Kazakh, Russian
7. Degree awarded: Doctor of Philosophy PhD in the educational program "7M05102 - Biotechnology"
8. Type of EP: current EP
9. The level of the ISQ: 7
10. The level of the NQF: 7
11. Level according to the IQF: 7
12. Distinctive features of the EP: -
13. Number of the application to the license for the direction of training: KZ83LAA00018495, date of issue 28.07.2020. Appendix 16
14. The name of the accreditation body and the validity period of the EP accreditation: -
15. Purpose of the EP: Training of qualified specialists for the development of economy, industry and culture of the Republic of Kazakhstan, providing conditions for full education, professional competence of specialists-biotechnologists for the production of biotechnological products for various purposes, the development of new biotechnological processes, solutions of practical and theoretical problems of biotechnology in the scientific and practical sphere, teaching.
16. Qualification characteristics of the graduate

a) A list of graduate positions: researcher at research institutes and centers of biotechnological profile, process engineer at chemical, food, pharmaceutical enterprises, biotechnologist collector, specialist of environmental protection enterprises, employee of laboratories for quality control and food safety, biochemical laboratories of medical institutions, sanitary and environmental supervision, teacher at universities and colleges.

b) The scope and objects of professional activity of the graduate: research institutes, research and production centers of biotechnological, biological, medical, agricultural profile, chemical, food, pharmaceutical enterprises, organizations of sanitary and environmental supervision, organizations engaged in certification and standardization, agricultural complexes, greenhouse fruit and vegetable agricultural plants, universities and colleges.

c) Types of professional activity of the graduate:

- organizational and technological: management and engineering activities, research and engineering and technological developments, analysis and control of compliance with the technology of management of biotechnological production, examination of quality and standardization of products, scientific and organizational activities;
- production and management: control over production and management activities, biotechnological production management, analysis of the effectiveness of management decisions and standard tasks of the management system in the field of biotechnology;

- project: development and justification of organizational management structures, feasibility study aimed at the development of documentation, introduction of new types of products, sanitary and environmental supervision for compliance with professional standards and regulatory documents;

- research: independent research work, development and participation in research projects, grants, scientific and organizational activities in various fields of biotechnology, scientific cooperation;

- educational: teaching at a university, professional work with students and specialists, deepening professional knowledge with the help of modern information and educational technologies.

d) Functions of the graduate's professional activity:

- participation in the development of state programs in the field of biotechnology;
- implementation of the production of biotechnological products;
- improvement of biotechnological methods and processes to improve the technological characteristics of biotechnological products and increase the efficiency of biotechnological production processes;
- development and provision of quality control management systems for biotechnological products;
- creation of necessary conditions for cultivation and biological realization of biotechnology objects;
- development and implementation of the results of scientific research on biotechnology in production;
- implementation of research and teaching activities in accordance with modern requirements;
- organization of information retrieval work, analysis of research objects in the chosen scientific direction;
- examination of the quality and standardization of biotechnological products;
- control of management and engineering activities at a biotechnological enterprise;
- creation of technical documentation for the development of biotechnological processes.

Formulation of learning outcomes based on competencies

Type of competencies	Learning result code	Learning result (according to Bloom's taxonomy)
1. Behavioral skills and personal qualities: (Soft skills)	LR 3	Reads, analyzes, referees literature in a foreign language and studies foreign sources. Presents information and scientific research in native and foreign languages.
	LR 9	Uses knowledge of a foreign language in professional and interpersonal communication.
	LR 11	Evaluates the results of his professional activity.
2. Digital competencies: (Digital skills):	LR 13	Introduces and applies technological innovations, digital technologies and scientific developments in the field of food production, biolog-ically active additives, improves existing technologies for analyzing raw materials of biological products and the technological process of products.
	LR 12	Skills to publish the results of scientific research, analyzes the main sources and methods of searching for scientific information.
3. Professional competencies: (Hardskills)	LR 1	Demonstrates knowledge of the history of the formation and development of the philosophical and methodological foundations of science.
	LR 2	Owns modern methods, methodology of research activities in biotechnology.
	LR 4	Presents and substantiates the results of research work using modern research methods and appropriate instruments.
	LR 5	Substantiates the results of scientific research using modern scientific approaches and research methods using new technologies and devices, observes the principles of biological ethics, explores the process of involving the results of scientific research and development in commercial turnover in market segments.
	LR 6	Summarizes the main features of environmental crisis situations, uses professional training to develop biotechnological methods of environmental protection.
	LR 7	Analyzes the patterns of energy relationships between organisms of the biosphere, applies resource- and energy-saving biotechnologies, regulations and standards in the development and implementation of ecobiotechnological projects, requirements for production, standardization, quality control and compliance with the safety of biotechnological products.
	LR 8	Modern ideas in the field of nanotechnology, nanobiohasafety, technologies for the development of medical biological preparations, monoclonal antibodies, diagnostics, vaccines, and the formation of the concept of immunobiotechnology are summarized.
	LR 10	Demonstrates knowledge of fundamental and applied sections of biotechnology. Uses knowledge of modern problems of biotechnology in the field of professional activity.

Determination of modules of disciplines in accordance with the results of training

Learning result code	Name of the module	Name of disciplines	Volume (ECTS)
LR 1, LR 2, LR 3, LR 5, LR 9, LR 10, LR 11, LR 12, LR 13	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
		Pedagogy of higher education	4
		Management psychology	4
		Pedagogical practice	4
LR 1, LR 3, LR 4, LR 5, LR 9, LR 12, LR 13	Professional languages	Foreign language (professional)	4
		Scientific-research communications	5
		English for STEM Program	
LR 1, LR 2, LR 3, LR 4, LR 5, LR 6, LR 7, LR 8, LR 9, LR 10, LR 11, LR 13	Issues of modern science and technology	Commercialization of scientific and technological activities	5
		Bioenergetics	
		Biotechnological methods of environmental protection	5
		Biological safety standards	
LR 1, LR 2, LR 3, LR 4, LR 5, LR 6, LR 7, LR 9, LR 10, LR 11, LR 12	Molecular genetic foundations of biotechnology	Research methodology in biotechnology	5
		Molecular genetics	5
		Human genome	5
LR 2, LR 3, LR 4, LR 5, LR 6, LR 7, LR 8, LR 10, LR 11, LR 12, LR 13	Applied areas of biotechnology	Modern food production biotechnology	5
		Biotechnological methods in production	
		Bioethics	5
		Physiology of microbial resistance	
		Biomedicine and nanotechnology	5
		Probiotics and nutraceuticals	
		Mechanisms of action of hormones	5
		Immunobiotechnology	
LR 1, LR 2, LR 3, LR 9, LR 12	Scientific research work	Research practice	14
		Scientific research work of a master student, including an internship and a master's thesis (NIRM)	24
	Final attestation	Writing and defending a doctoral dissertation	12

Matrix of achievability of learning outcomes

NN п/п	Name of disciplines	Brief description of the discipline (30-40 words)	Number of credits	Generated learning outcomes (codes)												
				LR 1	LR 2	LR 3	LR 4	LR 5	LR 6	LR 7	LR 8	LR 9	LR 10	LR 11	LR 12	LR 13
Cycle of basic disciplines University component																
D1	History and philosophy of science	History and philosophy of science as a study of the General laws of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Science as a cognitive activity and tradition, as a social institution and as a special sphere of culture. Science in the culture of modern civilization. Features of scientific knowledge. Functions of science in society. Historical development of institutional forms of scientific activity.	4	+	+			+				+	+	+	+	+
D2	Pedagogy of higher education	Pedagogy of higher education is designed to put on a scientific basis both the solution of the problem of higher education for specific specialties, and the development of management of the process of mastering this content by undergraduates in their future professional activities. Higher school pedagogy allows us to scientifically substantiate the requirements for the modern educational process and identify its regularities.	4	+				+				+	+	+	+	+
D3	Management psychology	Formation system ideas about the psychological regularities of managerial activity, in revealing the specifics of using socio-psychological knowledge in the structure of the Manager"s activity, in mastering the skills of analyzing the socio-psychological principles underlying effective management.	4	+	+	+		+				+	+	+	+	+
D4	Pedagogical practice	Formation of knowledge about the legal and regulatory framework for the functioning of the higher education system; the order of implementation of the main provisions and documents regulating the activities of the University to improve educational, methodological and scientific work. Analysis of active teaching methods and the use of modern educational technologies in teaching, monitoring and evaluating the effectiveness of educational	4	+		+		+				+	+	+	+	+

		activities, organization of students ' educational activities															
D5	Foreign language (professional)	The content of the discipline "Foreign language" and the variable part "Professional foreign language" include three main components that are closely interrelated due to the integrativity of foreign language competence: communication areas and topics; socio-cultural knowledge; linguistic knowledge	5	+		+	+	+				+			+	+
D6	Scientific-research communications	The study of the mechanisms for promoting scientific ideas within the scientific community and beyond, the issues of disseminating scientific knowledge about the surrounding reality through various forms and institutions of communication. Formation of knowledge about topical problems of experimental, design and research activities. Analysis of the patterns of development of the natural environment, society, technologies	5		+	+	+	+						+	+		
	English for STEM	Formation of an idea about academic and professional interaction, global trends and practices of STEAM technologies. Improving skills in professional 3D modeling programs. Improving the competencies of possession of the necessary skills of professional communication in a foreign language and writing, the use of professional English in the practical activities of biotechnologists				+	+	+				+				+
Cycle of basic disciplines Component of choice																	
D7	Commercialization of scientific and technological activities	Study of the main approaches and the process of commercializing the results of scientific and intellectual activities, attracting investment, implementing developments in production and their further support. Knowledge of the practice of scientific and technical innovation and the results of technology commercialization, conditions for the development of science and technological innovation policy, the ability to develop an action plan to achieve the results of commercialization of science and technology	5	+	+		+	+	+	+	+	+		+		+
	Bioenergetics	Formation of knowledge about the prospects of bioenergy development. Analysis of current problems of bioenergy and biotechnology, assessment of the energy potential of biomass. Understanding the principles and criteria for the production and use of bioenergy. Ownership scientific research and engineering developments to improve the mechanisms of technological support for bioenergy and efficient energy use. Application			+	+	+	+	+	+	+		+		+		

		of methods of photosynthetic microorganisms for obtaining biofuels and biomass																
D8	Biotechnological methods of environmental protection	Study of ecobiotechnological methods used in industry, agriculture and everyday life, aimed at protecting the natural environment from pollution and depletion. Ability to analyze the technogenic impact on the environment. Knowledge of the use of biotechnological methods in the protection and protection of the environment from pollution by organic substances, mineral salts and other types of waste of the national economy	5		+		+		+	+	+		+			
	Biological safety standards	The study of modern concepts, norms and standards for ensuring biological safety in laboratory conditions. Mastering the methodology of applying quality standards, the principles of certification of research laboratories, the basics of biosafety control when working with biological objects. The use of key indicators for indexing, assessment methods and principles of risk forecasting			+		+	+	+	+			+			
Cycle of major disciplines University component																		
D9	Research methodology in biotechnology	Formation of knowledge about methodological theories and principles, latest achievements, research directions and practical implementation of biotechnological science. Analysis of methods of chemical-technological, biochemical and microbiological control of biotechnological processes. Ability to work with devices and production controls in accordance with technical data sheets and instructions.	5	+	+	+	+	+	+	+	+	+	+				
D10	Molecular genetics	Knowledge of mechanisms of biological processes, enzymes involved in the processes of protein and DNA synthesis. Ability to determine methods of cultivation and hybridization of animal cells. Application of methods and devices for DNA replication and modification.	5		+		+		+	+	+		+	+	+	
D11	Human genome	Formation of knowledge about the basic concepts of cytokines and growth factors-regulators of intercellular interaction. Ability to use modern molecular and biological data on the structure and functioning of DNA and RNA, stem cells in scientific research. Proficiency in analysis and research in the field of human genome.	5		+	+	+	+	+	+	+		+	+	+	
Cycle of major disciplines Component of choice																		
D12	Modern food production biotechnology	Familiarization with technological innovations, scientific developments in the field of food production, the creation of food products for general, ther-	5		+		+	+					+			+

		apeutic and preventive purposes and special orientation. Substantiation of compliance with the development trend and state policy in the field of healthy nutrition. Development of technologies for deep processing of food raw materials, radical reduction of food industry waste														
	Biotechnological methods in production	Formation of knowledge about modern biotechnological methods in production and prospects for its development. Understanding the principles of biotechnological processes. Analysis of the main objects and areas of application of biotechnology, large-scale industrial biotechnological production. Knowledge of methods of working with biological objects and equipment of biotechnological processes			+	+	+	+	+	+	+		+	+	+	
D13	Bioethics	Formation of knowledge about bioethics, category of bioethics, functions of the international Association of bioethics in scientific research. Analysis of scientific and technological achievements and conventions on biological, toxic and chemical weapons. Knowledge of how to implement national Biosafety measures through national, regional and international partnerships. Application of methods of scientific knowledge, ethical standards, increasing the level of knowledge on bioethics and biological safety	5		+		+			+	+		+	+	+	+
	Physiology of microbial resistance	Formation of knowledge about modern research of adaptive potential of microorganisms and mechanisms of its formation. Understanding the mechanisms of resistance and adaptation of microorganisms to various environmental conditions Analysis of the possibility of managing the adaptive potential of microorganisms for subsequent practical use in medicine, biotechnology, agriculture. Application of methods for studying the biochemical potential of microorganisms on the environment			+		+	+	+	+	+		+	+	+	
D14	Biomedicine and nanotechnology	The formation of knowledge in the field of nanotechnology, nanomedicine and of nanobiosecurity. Analysis of data on nanomaterials in cell culture technology, application of nanostructures in Biomedicine, and modern advances in nanotechnology in the diagnosis of malignant neoplasms. Knowledge of methods of planning and developing schemes of biomedical experiments; principles of analysis of nanotechnological developments.	5		+		+	+	+	+	+		+	+		
	Probiotics and nutraceuticals	Knowledge of modern ideas about the formation of nutrition taking into account individual human needs, the use of dietary supplements-nutraceuticals. Determination of the functional role			+		+			+	+			+		+

		of dietary supplements-probiotics. Study of the ways in which probiotics enter the human body. Mastering technologies for the development of probiotic products of mixed composition. Analysis of documentation on control, differentiated assessment of quality, safety and effectiveness of dietary supplements															
D15	Mechanisms of action of hormones	Formation of knowledge about the General principles of biosynthesis and secretion of hormones, the main types of membrane receptors, the kinetics of formation and decay of hormone-receptor complexes. Applying the obtained knowledge in practice to solve actual practical problems in the field of biochemistry and physiology. Ability to independently conduct experiments according to a given scheme, using laboratory equipment and devices.	5		+	+	+	+		+	+		+	+		
	Immunobiotechnology	Study of mechanisms of immunoregulation of biotechnological production, technologies and methods for research of the functions of the human immune system. Mastering the principles of the organization of quality control of biological products. Application of methods of bioengineering and modern biotechnology based on the production of diagnostic and medicinal products. Development of documentation on quality control of biological products					+	+		+	+						+
D16	Research practice	The purpose of the research practice is to study the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as to consolidate practical skills in applying modern methods of scientific research, processing and interpretation of experimental data in dissertation research	14	+	+	+						+			+		

Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module

Learning outcomes	Planned learning outcomes for the module	Teaching methods	Assessment methods
LR1	Demonstrates knowledge of the history of the formation and development of the philosophical and methodological foundations of science.	round table	preparation of the presentation
LR2	Owns modern methods, methodology of research activities in biotechnology.	interactive lecture	testing
LR 3	Reads, analyzes, referees literature in a foreign language and studies foreign sources. Presents information and scientific research in native and foreign languages.	business game	preparation of the presentation
LR 4	Presents and substantiates the results of research work using modern research methods and appropriate instruments.	case study method	project preparation
LR 5	Substantiates the results of scientific research using modern scientific approaches and research methods using new technologies and devices, observes the principles of biological ethics, explores the process of involving the results of scientific research and development in commercial turnover in market segments.	method of projects	preparation of the presentation
LR 6	Summarizes the main features of environmental crisis situations, uses professional training to develop biotechnological methods of environmental protection.	interactive lecture	testing
LR 7	Analyzes the patterns of energy relationships between organisms of the biosphere, applies resource- and energy-saving biotechnologies, regulations and standards in the development and implementation of ecobiotechnological projects, requirements for production, standardization, quality control and compliance with the safety of biotechnological products.	method of analysis of specific situations	project preparation
LR 8	Modern ideas in the field of nanotechnology, nanobiobasafety, technologies for the development of medical biological preparations, monoclonal antibodies, diagnostics, vaccines, and the formation of the concept of immunobiotechnology are summarized.	discussion	project preparation
LR 9	Uses knowledge of a foreign language in professional and interpersonal communication.	research method	participation in the colloquium
LR 10	Demonstrates knowledge of fundamental and applied sections of biotechnology. Uses knowledge of modern problems of biotechnology in the field of professional activity.	interactive lecture	conducting a colloquium
LR 11	Evaluates the results of his professional activity.	project training	preparation of the presentation
LR 12	Skills to publish the results of scientific research, analyzes the main sources and methods of searching for scientific information.	project training	writing an essay
LR 13	Introduces and applies technological innovations, digital technologies and scientific developments in the field of food production, biologically active additives, improves existing technologies for analyzing raw materials of biological products and the technological process of products.	round table	preparation of a scientific article

Graduate Model EP 7M05102 - Biotechnology

Graduate Attributes:

Deep professional knowledge in their field of study
Interest in mastering trends in education and science
Ability to collaborate in the professional community
Independence in the search for opportunities for professional and personal development
Communication skills
Tolerance and good manners
Academic integrity
Willingness to participate in solving state tasks and strategies of Kazakhstan

Types of competencies	Description of competencies
1. Behavioral skills and personal qualities (Softskills)	Ability to critical thinking, analysis, independent organization of their professional activities. The ability to quickly solve tasks, act in non-standard situations, take responsibility for yourself. The ability to independently develop, define and solve problems of professional and personal development, engage in self-education. Knowledge of work ethics, discipline, sense of responsibility, ability to work in a team.
2. Digital competencies (Digital skills):	The ability to develop and use information and communication technologies in professional activities, to have awareness of the basic technologies of digital learning. The ability to analyze the principles, prospects for the development of biological science and substantiate scientific approaches using digital technologies Ability to master the generally accepted language of international communication in the digital environment, knowledge about information security in the field of blockchain technology application
3. Professional competencies (Hardskills)	Ability to develop, implement and apply innovative technologies, modern methodological approaches of scientific research in the field of biology The need to present and substantiate the results of research work using modern research methods and equipment The ability to use promising digital developments in professional activity, to substantiate scientific approaches to the use of digital technologies in professional practice The ability to navigate scientometric databases, carry out peer review and expert evaluation of research activities, present research results in the form of a scientific report, article, report, dissertation, professional conduct of scientific discussions The ability to defend their position on modern problems of biology and compliance with biological safety, to justify and develop plans for the use of alternative technology to solve biological problems. The ability to determine scientific approaches to the development of practical recommendations and modern research methods for the conservation of biodiversity, to develop programs for the safe operation of hazardous production facilities, to manage technological processes The ability to justify, implement and implement technological processes of production, apply modern methods of processing, analysis and synthesis of biological information in production

Developers:

Members of the working group:

Head of the Department of Physiology, Candidate of Biological Sciences, Professor	G.M. Tykezhanova
Candidate of Medical Sciences, Associate Professor	Sh.M. Nugumanova
Candidate of Biological Sciences, assistant professor	G.Zh. Mukasheva
Master's student of 1 year of study	O.B. Olzhabai
Employer: Director of Quality Karaganda Pharmaceutical Complex LLP	B.M Tanaguzova

The educational program was reviewed by the Faculty Council from 25.03.2022 y protocol № 8

The educational program was reviewed at the meeting of the Academic Council from 28.04.2022y protocol № 5

The educational program was reviewed and approved at the meeting of the University Board from 26.05.2022y. protocol № 12

Board Member-Vice-Rector for Academic Affairs **T.Z. Zhysipbek**

Director of the Academic Work Department **G.S. Akybaeva**

Dean of the Faculty of Biology and Geography **S.A. Talzhanov**