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KARAGANDA TECHNICAL UNIVERSITY

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« 27 » 2021

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Council

Protocol № 13 from 29.04 2021


Chairman of the Board - Rector
Ibatov M.K.

MODULAR EDUCATIONAL PROGRAM
in the direction of training 6B051 "Biological and related sciences"
6B05101 "Biotechnology"
Level: Undergraduate
Awarded degree - "Bachelor of Science"

Karaganda 2021

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Modular educational program

6B05101 "Biotechnology"

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Introduction

Modular educational program **6B05101 "Biotechnology"** was developed on the basis of the following regulatory documents:

Law of the Republic of Kazakhstan "On Education" dated July 27, 2007 No. 319-III 3PK, with amendments and additions dated June 25, 2020 No. 347-VI.

Model rules for the activities of educational organizations of the corresponding types (Order of the Minister of Education and Science of the Republic of Kazakhstan dated 30.10.2018 No. 595, with amendments and additions dated 18.05.2020 No. 207).

State Compulsory Education Standards (SES) of all levels of education (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604, with amendments and additions dated 05.05.2020 No. 182).

Of the Rules for organizing the educational process on credit technology of education (Order of the Minister of Education and Science of the Republic of Kazakhstan No. 152 dated April 20, 2011, with amendments and additions No. 563 dated October 12, 2018).

Sectoral qualifications framework "Chemical production" Approved by the minutes of the Meeting of sectoral commissions on social partnership and regulation of social and labor relations for the mining, metallurgical, chemical, construction industry and woodworking, light industry and mechanical engineering No. 1 dated 16.08.2016.

Qualification reference book of positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-ø-m, with amendments and additions dated April 17, 2013, No. 163-ø-m.

A modular educational program is a complex document that defines the goals, objectives and results of education, the structure and content of working curricula and programs, methods and methods of their implementation, educational, methodological and resource support of the educational process and criteria for assessing the educational achievements of students.

1 Objectives of the Modular Education Program

The application of this Modular educational program provides for the achievement of the following goals:

- in practice, implement the democratic principles of managing the educational process, expand academic freedom and opportunities for higher educational institutions;
- to ensure the adaptation of the content of the educational program of higher education and scientific research to the changing needs of society and the achievements of scientific thought;
- to ensure the recognition of the level of training of graduates in other countries;
- to ensure higher mobility of graduates in the changing conditions of the labor market;
- training of specialists for the organization of biotechnological production.

2 Passport of the Modular educational program

2.1 List of qualifications and positions

The graduate of this Modular educational program is awarded the degree "Bachelor of Science".

Qualifications and positions are determined in accordance with the "Qualification handbook of positions of managers, specialists and other employees" approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-o-m, with amendments and additions dated April 17, 2013 No. 163-o-m.

2.2 Kvalifikatsionnaya kharakteristika vypusknika

2.2.1 Sfera professional'noy deyatel'nosti Sferoy professional'noy deyatel'nosti vypusnikov yavlyayutsya promyshlennost', nauka, obrazovaniye, zdravookhraneniye, sel'skoye khozyay-stvo, gosudarstvennoye upravleniye.

2.2.2 Ob'yekty professional'noy deyatel'nosti Ob'yektami professional'noy deyatel'nosti vypusnikov yavlyayutsya predpriyatiya i organizatsii razlichnykh form sobstvennosti, razrabatyvayushchiye, vnedryayushchiye i ekspluatiruyushchiye biotekhnologicheskiye protsessy v razlichnykh oblastiakh chelovecheskoy deyatel'nosti. **2.2.3** Predmet professional'noy deyatel'nosti Predmetami professional'noy deyatel'nosti vypusnikov yavlyayutsya nauchno-issledovatel'skiye instituty i VUZy biotekhnolo-gicheskogo, biologicheskogo, meditsinskogo, sel'skokhozyaystvennogo profilya; proizvodstvennyye predpriyatiya i laboratorii pishchevoy i pererabatyvayushchey, mikrobiologicheskoy, farmatsevticheskoy promyshlennostey; laboratorii po kontrolyu za kachestvom i bezopasnost'yu sel'skokhozyaystvennoy produktsii; ekologicheskkiye sluzhby i organizatsii; botanicheskkiye sady i zoologicheskkiye parki, selektsionnyye stantsii, VUZy i kolledzhi.

2.2 Qualification characteristics of the graduate

2.2.1 Sphere of professional activity

The sphere of professional activity of graduates is industry, science, education, health care, agriculture, public administration.

2.2.2 Objects of professional activity

The objects of professional activity of graduates are enterprises and organizations of various forms of ownership, developing, implementing and operating biotechnological processes in various fields of human activity.

2.2.3 Subject of professional activity

The subjects of professional activity of graduates are research institutes and universities of biotechnological, biological, medical, agricultural profile; manufacturing enterprises and laboratories of the food and processing, microbiological, pharmaceutical industries; laboratories for control over the quality and safety of agricultural products; environmental services and organizations; botanical gardens and zoological parks, breeding stations, universities and colleges.

2.2.4 Professional activities

"Bachelor of Natural Science" under the educational program 6B05101 - "Biotechnology" can perform the following types of professional activities:

production and technological activities: - analysis of the main ingredients of food products; determination of components of raw materials and finished products; development and implementation of new technological processes;

breeding activity: - study of source material for breeding plants, animals and microorganisms; study of the influence of environmental factors on the genotype of plants, animals and microorganisms in order to achieve their maximum productivity; study of the peculiarities of breeding plants, animals and microorganisms of domesticated species; study of the world gene pool of plants, animals and microorganisms for breeding; intensification and improvement of the efficiency of the breeding process through the introduction of biotechnological methods;

service and operational activities: - carrying out metrological support of production; drawing up standards for raw materials and finished products, providing them with certificates, choosing personal protective equipment for workers in the specialty profile;

installation and commissioning activities: - the use of measuring equipment for the study of technological processes; control of trouble-free operation of electrical devices; measurement and assessment of the parameters of the industrial microclimate, the level of dust and gas pollution, noise, vibration and illumination of workplaces;

settlement and design activities: - execution of sketches and drawings of machines, devices and their parts; reading general arrangement drawings; Calculation of calorific value, thermal conductivity, heat transfer; analysis of economic and commercial activities of enterprises and various organizations; analysis of information base, marketing and management.

experimental research: - experimental study of the properties and processes of vital activity of biological objects; research of biotechnological processes; design of biotechnological devices and equipment; modification of genotypes of biological objects with economically valuable traits.

educational (pedagogical) activities: - teaching the basics of biotechnology in secondary educational institutions.

2.2.5 Functions of professional activity

The main functions of the professional activity of graduates are: production of biotechnological products; quality control of biotechnological products; cultivation of biotechnology objects; carrying out biotechnological processes.

2.2.6 Areas of professional activity

Areas of professional activity include:

- carrying out research work to analyze and select the optimal conditions for the cultivation of biological objects in biotechnology;
- planning, organization and implementation of experimental and production work;
- providing conditions for the implementation of biotechnological processes in production conditions.

3. Modular Educational Program Map

Module code and name	Discipline code and name	Cycle / component	The form control	Semester	Loan volume ECTS	Formed competencies
GED- General education disciplines						
RC - Required component						
OOD 01 Module General education disciplines 1	SIK 1101 Modern history of Kazakhstan	OOD/OK	state exam	1	5	Know: objective historical knowledge about the main stages of the history of modern Kazakhstan; to direct the attention of students to the problems of the formation and development of statehood and historical and cultural processes; Be able to: demonstrate knowledge of the main periods of the formation of an independent Kazakhstani statehood; analyze the features and significance of the modern Kazakhstani development model; to determine the practical potential of intercultural dialogue and respect for the spiritual heritage; Have skills: systematization of historical knowledge about the main events of modern history that form the scientific worldview and civic position; Be competent: in the ability to correlate individual phenomena and events of the historical past with the general paradigm of the world-historical development of human society through critical analysis, retrospective, comparative historical and other methods of scientific research.
	Fil 2102 Philosophy	OOD/OK	Exam	3	5	Know: subject, functions, main sections and directions of philosophy; actual problems of modern domestic and world philosophy; Be able to: use the provisions and categories of philosophy to assess and analyze various social trends, facts and phenomena; Have the skills: to apply the knowledge gained in life situations and in the analysis of social phenomena; Be competent: in the main problems and directions in philosophy, in the study of philosophical problems of our time, as well as methods and approaches.
	IYa 1103 Foreign language	OOD/OK	Exam	1,2	10	Know: the lexical and grammatical minimum of a foreign language of a general and professional nature to the extent necessary for the implementation of communicative intentions in all types of speech activity within the achieved level in accordance with the Common European Framework of Reference for Languages; Be able to: realize their knowledge, skills, skills and practical experience in the course of interaction with representatives of another culture; Have skills: speaking and writing foreign language in accordance with the achieved level reflected in the descriptors within the framework of the standards of the Common European Framework of References for Languages; Be competent: in the use of a foreign language in communicative situations of communication with the awareness of the need to use appropriate speech patterns <i>and tactics of speech behavior in interaction with representatives of a different culture.</i>
	K(R)Ya 1104 Kazakh	OOD/OK	Exam	1,2	10	Know: the norms of the literary language; definition: text, main idea, topic and paragraph of text; functional styles of speech, their signs and rules of use; features of oral and written business

	(Russian) language					<p>communication; composition and requirements for the language of public speaking; about lexical and grammatical units based on informational and educational texts; on the ability to distinguish between the features of written and oral types of business and scientific styles; about the functional styles of the language, the scope of their use, about the main style features and linguistic features; about the features of oral public speech; about history, literature, customs, traditions, science, art, poets-writers of the Kazakh people: about the main speech thematic-composite types - monologue-description, monologue-reasoning, monologue-presentation, monologue-analysis, dialogue-story; successful mastering of the types of speech activity in accordance with the level training; formation and improvement of language skills in various situations of everyday, socio-cultural, professional communication; the formation of skills in the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication;</p> <p>Be able to: analyze the structural and semantic organization of the text; determine the linguistic means of organizing the text; to determine the structural and semantic features of texts of various styles; work with texts of different styles and genres based on a system of tasks and training exercises; make the right choice and use of linguistic and speech means for solving certain problems of communication and cognition based on knowledge of a sufficient volume of vocabulary, a system of grammatical knowledge, pragmatic means of expressing intentions; convey the factual content of texts, formulate their conceptual information, describe inferential knowledge (pragmatic focus) of both the entire text and its individual structural elements; interpret the information of the text, explain in the scope of certification requirements the style and genre specificity of texts in the socio-cultural, socio-political, official-business and professional spheres of communication;</p> <p>Have the skills: to express your opinion: to teach to compose a monologue-description, to organize a conversation, a dispute; to develop the ability to speak using professional vocabulary, to form the ability and skills to speak actively, in general; request and communicate information in accordance with the communication situation, evaluate the actions and actions of participants, use information as a tool to influence the interlocutor in situations of cognition and communication in accordance with certification requirements; to build programs of speech behavior in situations of personal, social and professional communication in accordance with the norms of language, culture, the specifics of the sphere of communication, certification requirements;</p> <p>Be competent: in the process of mastering all types of speech activity and the basics of oral and written speech; in understanding various types of communicative statements, as well as in building holistic and logical statements of different functional styles; in discussing ethical, cultural, socially significant problems, expressing one's point of view, in the ability to defend it reasonably, critically assess the opinion of the interlocutors; in the process of communication in various situations of different spheres of communication in order to realize their own intentions and needs (domestic, educational, social, cultural); in the ability to compose everyday, socio-cultural, official-business texts in accordance with generally accepted norms, functional orientation using lexical-grammatical and pragmatic material of a certain certification level.</p>
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	<p>IKT 1105 Information and communication technologies</p>	<p>OOD/OK</p>	<p>Exam</p>	<p>1</p>	<p>5</p>	<p>Know: economic and political factors have contributed to the development of information and communication technologies; features of various operating systems; architecture, be able to calculate and evaluate performance indicators of supercomputers; Be able to: identify the main trends in the field of information and communication technologies; use information resources to search and store information; work with spreadsheets, perform data consolidation, build graphs; work with databases; apply methods and means of information protection; design and build simple websites; to process vector and raster images; create multimedia presentations Have the skills to: use various social platforms for communication; use various forms of e-learning to expand professional knowledge; use various cloud services .. Be competent: using modern information and communication technologies in various fields of professional activity, scientific and practical work for self-education and other purposes.</p>
	<p>SPZ (SPKP) 2106 Module socio-political knowledge (sociology, political science, cultural studies, psychology)</p>	<p>OOD/OK</p>	<p>Exam</p>	<p>3,4</p>	<p>8</p>	<p>Know: typology and basic conditions for the emergence and development of social movements, factors of social development, forms of social interaction, the theory of social stratification and social mobility, role theory of personality. The essence, possibilities, boundaries and prospects of politics, the system and functions of political power, political regimes and institutions, state structure, its genesis and role in the life of society, political processes in the world and their connection with political processes in the Republic of Kazakhstan , the main global challenges of our time. The content of the global cultural and historical process, its stages and basic conceptual approaches. The main categories and concepts of psychological science; the main functions of the psyche; foundations of personality psychology; laws of human mental development. Be able to: give an analysis and assessment of social phenomena occurring in society. Consider politics as one of the forms of human activity for the structure of modern society, interact with state structures, formulate one's own interests and express them through the structures of civil society, apply political knowledge to solving professional problems, cultivate leadership qualities , strive for a worthy fulfillment of their civic and professional duties. Use the general cultural and moral and ethical heritage in professional activities. Assess the place of culture in human life. Diagnose individual psychological and personal characteristics of people, styles of their cognitive and professional activities; use psychological knowledge to solve research and practical problems. Have skills: preparation and organization of a specific case study. An independent analysis of the political situation in the country and in the world, the ability to assess the prospects for the development of modern political processes; search and analyze the necessary information, assess its significance, use in the decision-making process. The main general humanitarian categories, the method of analyzing sociocultural processes, the skills of respect for cultural values and sociocultural openness. Operate with the main categories of psychological knowledge; assess the level of formation of mental processes. Be competent: in knowledge of the basic concepts and theories of sociology, methodology and methods of sociological research; Stories of political thought, about modern political institutions, their structure and functioning, about the rights, freedoms and obligations of citizens, about the ways and forms of participation in political life, about the political situation in the modern world. The development of the discipline is aimed at the formation of general cultural competences: the ability and willingness to carry out their activities in various spheres of public life, taking into</p>

						account the moral and legal norms accepted in society; the ability and willingness to understand the role of art, strive for aesthetic development and self-improvement, respectfully and carefully treat the historical heritage and cultural traditions, tolerate social and cultural differences, understand the diversity of cultures and civilizations in their interaction. In the field of analysis of the characteristics of psychological institutions in the context of their role in society; conflict prevention technologies.
	FK 2107 Physical culture	OOD/OK	Exam	1,2,3,4	8	Know: the role of physical culture in human development and the training of a specialist; fundamentals of the state policy of the Republic of Kazakhstan in the field of physical culture and sports; To be able to: use in life practical skills and abilities that ensure the preservation and strengthening of health, the development and improvement of psychophysical abilities and qualities; apply the rules for the safe conduct of physical exercises and sports; Have skills: have health preservation skills; master the technique and tactics of a particular sport; provide assistance in organizing competitions and judging; Be competent: independently use the skills of professional adaptive physical culture in work and life situations, form the skills of participation in various types of competitive activity, use various forms and types of physical activity for organizing a healthy lifestyle, active rest and leisure.
<i>UC - University component</i>						
OOD 02 Module General education disciplines 2	OPEOAK 3108 Module Fundamentals of Law, Ecology, Fundamentals of Anti-Corruption Culture	OOD/VK	Exam	5	5	Know: the history of the state and law, the main institutions of the branches of law, their structure and functioning, the rights, freedoms and duties of citizens and their application in everyday life, the main provisions of the Constitution of the Republic of Kazakhstan, the main provisions of the current legislation of Kazakhstan, the system of government bodies and their terms of reference, the mechanism of interaction between substantive and procedural law. Basic laws of interaction between nature and society; basics of ecosystem functioning and biosphere development; the influence of harmful and dangerous production factors on the environment and human health; concept, sustainable development strategies and practical approaches to their solution at the global, regional and local levels; fundamentals of environmental protection legislation; principles of organizing safe production processes. The essence of corruption and the reasons for its origin, the measure of moral, ethical and legal responsibility for corruption offenses, the current anti-corruption legislation. To be able to: analyze events and actions from the point of view of the field of legal regulation and be able to refer to the necessary regulations; navigate the current legislation; using the law to defend their rights and interests. Assess the ecological state of the natural environment; assess the technogenic impact of production on the environment; critically comprehend the trends in the development of ecological and economic systems associated with the use of natural resources and characterize their ecological consequences. Implement the values of moral consciousness and follow moral norms in everyday practice, work to improve the level of moral and legal culture, use spiritual and moral mechanisms to prevent corruption. Have skills: conducting discussions on legal issues, on the application of norms in the modern period, legal analysis of various documents. Ecosystem component assessments; determination of optimal conditions for sustainable development of ecological and economic systems, including production processes; find a solution to nature conservation problems and optimal ways of ration-

						<p>al use of natural resources; possession of standard methods of environmental monitoring. Analyze situations of conflict of interests and moral choices.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to develop design documentation when designing technical objects, choose a biotechnological object to obtain the target product .</p>
BD – Basic disciplines						
UC- University component						
EN 03 Natural Sciences Module	Mat 1201 Mathematics	BD/VK	Exam	1	5	<p>Know: basic mathematical definitions and concepts; mathematical concepts and understand the relationship between them and their differences; mathematical methods for solving various problems in biotechnology and technology of organic substances.</p> <p>Be able to: apply mathematical methods of analysis of biotechnological and chemical processes; use the mathematical apparatus for calculating the optimal parameters in biotechnology and technology of organic substances.</p> <p>Have skills: creating a mathematical model, analyzing and transforming, interpreting the results; application of methods of theoretical and applied research in solving problems of biotechnology and technology of organic substances.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; carry out the analysis, planning and management of business activities of business entities.</p>
	Fiz 1202 Physics	BD/VK	Exam T3	2 1	5	<p>Know: basic physical phenomena and laws of classical and modern physics; methods of physical research; the influence of physics as a science on the development of technology; connection of physics with other sciences and its role in solving scientific and technical problems of the specialty; the state of modern measuring equipment;</p> <p>Be able to: assess the degree of reliability of the results of experimental or theoretical research methods; use modern physical principles in those areas of technology in which students specialize; formulate the laws of physics; determine quantities that describe phenomena and laws; to establish a connection between them (to express this connection analytically, graphically, in words); to present the main theoretical and experimental material with explanation and examples; apply the basic laws and principles of physics in standard situations; Build a model of a physical phenomenon with an indication of the scope of application.</p> <p>Have skills: solving generalized typical problems (theoretical and experimental - practical educational problems) from various fields of physics as the basis for solving professional problems; the ability and skills of conducting experimental research and processing their results, the ability to highlight the physical content in the applied problems of the future specialty; drawing up tables and graphs; evaluating the accuracy of the coincidence of experiments with theoretical data.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; carry out the analysis, planning and management of business activities of business</p>

						entities.
	NAH 2203 Inorganic and analytical chemistry	BD/VK	Exam	3	5	<p>Know: basic definitions and laws of chemistry; classification, nomenclature and properties of inorganic compounds; the structure of the atom and the systematics of chemical elements; modern theory of chemical bonding; general laws of chemical processes, thermo-chemical laws, thermodynamic condition for the probability of a process, the law of effective masses and its application to various chemical processes; basic concepts and laws concerning the doctrine of solutions, redox reactions and electrochemical processes; qualitative and quantitative analysis. Titration. Pendant-metry. Permanganatometry. Iodometry;</p> <p>Be able to: classify data, determine the type of problem, draw up an algorithm for its solution; to draw up equations of electrolytic dissociation, molecular and ionic equations of exchange reactions, hydrolysis, equations of redox reactions, radioactive decay; write down an expression for the equilibrium constant in solutions and heterogeneous systems, estimate the probability of the reaction proceeding by its thermodynamic parameters; conduct experiments in compliance with safety regulations;</p> <p>Have skills: handling chemicals, instruments and equipment; safe work with chemical and biological substances, development of measures for chemical safety;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to possess cognitive linguoculturological complexes for solving professional tasks; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry .</p>
	UP 1204 Study practice	BD/VK	Exam, report	2	5	<p>Know: organization of work at biotechnological enterprises;</p> <p>Be able to: independently draw up the results of the work performed; independently solve the assigned tasks; give answers that provide an opportunity for an adequate assessment of knowledge and professional training of future specialists; draw up reporting documentation;</p> <p>Have skills: work with objects of biotechnological production; use in your answer references to the relevant provisions of educational and scientific literature and show your own point of view;</p> <p>Be competent: in building a model of professional tasks and meaningful interpretation of the results; in the adaptation and implementation of typical biotechnological processes.</p>
PYaP 04 Module Professional Languages and Entrepreneurship	OE 2205 Fundamentals of Economics	BD/VK	Exam	3	5	<p>Know: patterns of development of economic processes; basic concepts created during the long evolution of economic thought; the principles of the functioning of the market mechanism, self-regulation and state influence on the economy;</p> <p>Be able to: systematize knowledge about the nature and forms of manifestation of economic phenomena and processes; to apply in practice the methods of scientific knowledge of economic phenomena and laws; understand and determine the place of property relations in the economic system;</p> <p>Have skills: an interdisciplinary approach to solving economic problems, as well as mastering knowledge for continuing education throughout life;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; to possess cognitive linguoculturological complexes for solving professional</p>

						tasks.
IPMBP 4206 Engineering entrepreneurship, marketing and business planning	BD/VK	Exam	7	6		<p>Know: methods of generating entrepreneurial ideas; the basics of building a business model; methodology for developing a business plan for an innovative project and assessing its effectiveness; fundamentals of commercialization of scientific and technical developments; the basics of investing and starting a new business; business infrastructure; legal aspects of entrepreneurial activity; goals, objectives, functions and main stages of business planning; types of business plans and their distinctive features; basic requirements for the development and structure of a business plan; methods for developing individual sections of a business plan and sources of their information support; ways to market a business plan and get investments; legal aspects of business planning.</p> <p>Be able to: find or generate commercially promising scientific and technical ideas; conduct market research in order to identify commercially promising niches for product sales; develop business models and transform them into business plans; create interdisciplinary teams; promote an innovative project; assess risks; present your results; choose the optimal structure of a business plan depending on its type and purpose; promote a business plan to the market, find investors; assess the risks and economic efficiency of the developed business plan; present a business plan to potential investors.</p> <p>Have skills: creative thinking and generation of promising scientific and technical ideas; forecasting trends in economic development and identifying promising trends; business modeling and business planning; project management; team-education and teamwork; risk management; oratorical skills; successful presentation; generating commercially promising business ideas; forecasting and long-term planning; conducting marketing analysis, analysis of the internal and external environment, analysis of the competitiveness of the manufactured product; calculation of financial indicators; forming a summary of a business plan; attracting the attention of investors to the business plan and its successful presentation.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; choose a biotechnological object to obtain the target product; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
POK (R)/IYa 3207 Professionally oriented Kazakh (Russian) / foreign language	BD/VK	Exam	6	5		<p>Know: scientific vocabulary and scientific constructions of a technical profile; rules for the production of scientific text and language design; speech norms of the technical sphere of activity; basics of business communication;</p> <p>scientific vocabulary and scientific constructions of a technical profile; rules for the production of scientific text and language design; speech norms of the technical sphere of activity; basics of business communication;</p> <p>features of oral and written professionally oriented texts, including scientific and technical ones; the main stylistic characteristics of the scientific presentation of the material in the studied foreign language;</p> <p>Be able to: generalize and interpret scientific and technical information; use the basic methods of information processing of oral and written text; choose linguistic means in accordance with the communicative intention and communication situation; use etiquette forms of scientific and pro-</p>

						<p>professional communication; clearly state your point of view on a scientific problem in the Kazakh language;</p> <p>generalize and interpret scientific and technical information; use the basic techniques of information processing of oral and written text; choose linguistic means in accordance with the communicative intention and communication situation; use etiquette forms of scientific and professional communication; clearly state your point of view on a scientific problem in Russian;</p> <p>freely read, translate literature in the chosen specialty with subsequent analysis; independently prepare and make oral messages on professional topics; transmit in writing in a foreign language and correctly draw up information;</p> <p>Have skills: the production of secondary scientific texts: annotations, abstracts, summaries, abstracts. reports; independent search for scientific and technical information as the basis of professional activity; free presentation of your thoughts in oral and written form on professionally significant topics; have the skills to prepare messages, reports on professional topics;</p> <p>the production of secondary scientific texts: annotations, abstracts, summaries, abstracts. pre-treasures; independent search for scientific and technical information as the basis of professional activity; free presentation of your thoughts in oral and written form on professionally significant topics; have the skills to prepare messages, reports on professional topics;</p> <p>independent reading and translation of original literature in the specialty in order to extract the necessary information; participation in project activities; purposeful and active use of the possibilities of information technology as an essential means of improving the professional competence of a modern specialist, oral and written foreign language speech of professional communication in accordance with the achieved level reflected in the descriptors within the framework of the standards of the Common European Framework of References for Languages ;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; to possess cognitive linguoculturological complexes for solving professional tasks.</p>
SD 05 Special Disciplines Module	OB 2208 Biotechnology objects	BD/VK	Exam	3	5	<p>Know: objects and methods of biotechnology; basic approaches to biotechnological research; structure of DNA and RNA; the main biological systems involved in the technology of recombinant DNA.</p> <p>To be able to: own the terminology adopted in the field of biotechnology, apply the methods of complex analysis, draw up and substantiate conclusions based on the results of research and analytical activities;</p> <p>Have skills: handling various types of raw materials, handling the main objects of biotechnology: microorganisms, plants, animals; cultivation of objects on nutrient media; work with microscopic equipment; work with laboratory equipment;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; carry out the analysis, planning and management of business activities of business entities; to possess cognitive linguoculturological complexes for solving professional tasks.</p>

	OB 3209 Fundamentals of Biotechnology	BD/VK	CW	5	5	<p>Know: modern requirements for biotechnological products; principles of selection of producers of biologically active compounds; principles of cell and genetic engineering; fundamentals of solving theoretical and applied problems of biotechnology; prospects for the development of biotechnology; modern and experimental methods of technology and processing of dairy products;</p> <p>To be able to: select conditions and carry out identification, isolation and cultivation of microorganisms-producers of biomass, organic acids, ethanol, amino acids, antibiotics; to determine possible pathways for the biosynthesis of key intermediates and target products to select the optimal biotechnological process;</p> <p>Have skills: possession of techniques for working with microorganisms; rules for safe work in a chemical and microbiological laboratory;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; carry out the analysis, planning and management of business activities of business entities.</p>
	PB 3210 Industrial biotechnology	BD/VK	Exam	6	5	<p>Know: modern problems of industrial biotechnology; state and prospects of its development; ways of creating and improving objects of biotechnology, the possibility of intensifying industrial biotechnological production from the standpoint of modern science; the main directions of the application of industrial biotechnology in solving the most important socio-economic problems in the field of agriculture, nutrition, health care;</p> <p>Be able to: apply scientific knowledge in the field of industrial biotechnology in educational and professional activities; search and analyze scientific information on topical issues of modern natural science;</p> <p>Have skills: possession of methods of working with biological objects of industrial biotechnology and laboratory equipment (thermostats, centrifuges, analyzers and specific devices).</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; to possess cognitive linguoculturological complexes for solving professional tasks.</p>
	PPI 2211 Industrial practice 1	BD/VK	Exam, report	4	5	<p>Know: technologies for the production of biotechnological products; biotechnology facilities and methods of their improvement; processes and apparatus used in biotechnology;</p> <p>Be able to: independently formulate, define methods and ways of performing professional tasks, collect data to analyze the use and functioning of biotechnological processes;</p> <p>Have skills: culturing cells of microorganisms, plants and animals; work with biotechnological equipment; work with regulatory documents in the field of biotechnology;</p> <p>Be competent: in building a model of professional tasks and meaningful interpretation of the results; in the adaptation and implementation of typical biotechnological processes</p>

KB – Component of choice

PO 6 Module Professionally oriented	IG 1212 Engineering graphics	BD/KV	Exam	2	5	<p>IG 1212 Engineering graphics Know: the basis of descriptive geometry; the laws of the formation of flat and spatial forms, methods of constructing their images; basic requirements of ESKD (Unified system of design documentation); Be able to: mentally imagine the shape, size and position of an object in space; determine the geometric shapes of parts; solve metric and positional problems for drawing up a projection drawing; perform graphic images of objects; apply technical means when making drawings. Have the skills to: read and execute product drawings; use of reference materials and sources; perception of design documentation as a production document. Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; carry out the analysis, planning and management of business activities of business entities.</p>
	// NG 1212 descriptive geometry					<p>//NG 1212 descriptive geometry Know: the basic projection models of the display of space on a plane, the apparatus of the two - three-sided complex drawing of G. Monge; laws of formation of flat and spatial forms, methods of constructing their images; theoretical foundations of obtaining axonometric, complex drawings; methods for solving positional and metric problems; drawing conversion methods; Be able to: read, solve problems of mutual belonging and mutual intersection of geometric figures; determine the geometric shapes of simple parts by their images; perform projection images of various geometric shapes; - read drawings of parts and assembly units; Have skills: thinking in spatial images; in solving positional and metric problems; construction of geometric shapes; use of reference materials and sources; Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; to possess cognitive linguoculturological complexes for solving professional tasks.</p>
	Bak 2213 Bacteriology					<p>Bak 2213 Bacteriology Know: the basic properties of microorganisms; classification of microorganisms; the role of microorganisms in nature and human life; the possibility of using microbes in the production of biologically active substances; about the kingdom of viruses, their use in the production of antiviral vaccines; indicators of assessments when accepting milk and dairy products, the procedure for rejecting non-conforming products; microbiology of milk and dairy products; Be able to: use the literature in the field of microbiology and virology; maintain production cultures of microorganisms; monitor the vital activity of microorganisms at various stages of the technological process; to carry out sanitary and microbiological control in laboratories and in production; carry out continuous and selective control of products at all stages of milk and dairy products production, reject inappropriate products, carry out experimental studies to create and improve the</p>

						<p>quality of dairy products, work according to the methodology, develop programs to ensure product quality, analyze the quality of raw materials and finished products , analyze the reasons for rejection and production of low quality products and downgrading of grades;</p> <p>Have skills: compliance with safety regulations, handling laboratory glassware and equipment, independent work on educational and special literature;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; carry out the analysis, planning and management of business activities of business entities.</p>
	// MBOG 2213 Molecular biology and fundamentals of genetics					<p>// MBOG 2213 Molecular biology and the basics of genetics</p> <p>Know: the current state of the problems of genetics and selection, the structure and properties of biological molecules;</p> <p>To be able to: competently conduct experiments to study heredity and variability and interpret the results obtained; learn to use the learned techniques and methods of genetics and selection for the needs of biotechnology.</p> <p>Have skills: using special reference material, breeding and genetic terminology, electronic genetic databases;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to develop design documentation when designing technical objects; choose a biotechnological object to obtain the target product.</p>
	KSE 3214 The concept of modern natural science	BD/KV	Exam	5	5	<p>KSE 3214 The concept of modern natural science</p> <p>Know: the main stages of the development of natural science, the natural nature of successive global natural scientific revolutions, the subordination of the main fundamental sections of natural science;</p> <p>Be able to: analyze the relationship and determine the periodic systems of fundamental structural elements of matter at the main sequential levels of its natural self-organization;</p> <p>Have the skills to: identify and constructively substantiate the fundamental integrity of all natural science and the relative independence of such natural sciences as physics, chemistry, psychology, philosophy, biology, computer science;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; choose a biotechnological object to obtain the target product.</p>
	//BPol 3214 Biopolitics					<p>// BPol 3214 Biopolitics</p> <p>Know: natural science concepts of life sciences (biology, genetics, ecology, evolutionary theory, etc.) in the political sphere;</p> <p>Be able to: establish the relationship of natural sciences with modern mass culture;</p> <p>Have the skills to: identify and constructively substantiate the fundamental integrity of all natural science and the relative independence of such natural sciences as physics, chemistry, psychology, philosophy, biology, computer science;</p>

						Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.
	ERPUOB 3215 Ecology and environmental management, waste disposal in biotechnology	BD/KV	Exam	6	5	ERPUOB 3215 Ecology and environmental management, waste disposal in biotechnology Know: ways and methods of protection of atmospheric air, water land resources, soil, flora, fauna from the impact of BT production; device and principle of operation of the main devices for dust and gas cleaning, wastewater treatment; Be able to: assess the impact of BT production on the environment; apply the knowledge gained in solving specific practical problems in the field of environmental protection in BT production; apply the knowledge gained in solving specific practical problems in the field of rational environmental management and waste disposal in biotechnology; to implement the principles of waste-free and resource-saving milk processing technologies in professional activities; Have skills: development and implementation of measures for the rational use of natural resources and waste disposal in biotechnology; Be competent in: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; carry out the analysis, planning and management of business activities of business entities; to develop design documentation when designing technical objects.
	// EBBP 3215 Environmental safety in biotechnological production					// EBBP 3215 Environmental safety in biotechnological production Know: ways and methods of environmental safety of atmospheric air, water, land resources, soil, flora, fauna from the impact of BT production; principles of ensuring safe BT production; To be able to: assess the impact of BT production on the environment and apply the knowledge gained in solving problems in the field of environmental safety in BT production; Have skills: development and implementation of measures for environmental safety in BT production; Be competent in: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; to develop design documentation when designing technical objects.
OFZhO 07 Module Fundamentals of Physiology of Living Organisms	FChZh 3216 Human and animal physiology	BD/KV	Exam	5	5	FChZh 3216 Human and animal physiology Know: theoretical and methodological foundations of physiology - the science of the main manifestations of life and their regulation; mechanisms and patterns of activity of the autonomic functions of the body; mechanisms that ensure the interaction of individual parts of the body and the body as a whole with the external environment; To be able to: own some methods of assessing the functional state of the body; apply the obtained theoretical knowledge and skills in practical and research activities; Have skills: compliance with safety regulations, handling laboratory glassware and equipment, independent work on educational and special literature; planning and conducting an experiment, interpreting its results, research activities; Be competent: to apply in professional activities the main provisions of the Constitution and legis-

	// OF 3216 General physiology					<p>lation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; choose a biotechnological object to obtain the target product.</p> <p>// OF 3216 General physiology</p> <p>Know: principles of organization of biological objects, biophysical and biochemical bases, membrane processes and molecular mechanisms of life; mechanisms of homeostatic regulation; methods of working with biological objects in the field and laboratory conditions;</p> <p>Be able to: explain various natural phenomena from the point of view of physiology; apply the principles of structural and functional organization of biological objects; to set up experiments with biological objects in field and laboratory conditions and explain the results obtained;</p> <p>Have skills: possession of methods of experimental work with modern equipment and plants in laboratory conditions; the main physiological methods of analysis and assessment of the state of living systems.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; choose a biotechnological object to obtain the target product.</p>
	KB 3217 Cellular biotechnology	BD/KKV	KP	6	5	<p>KB 3217 Cell biotechnology</p> <p>Know: modern trends in cellular and molecular biotechnology; theoretical and practical foundations of cell biotechnology;</p> <p>Be able to: apply the obtained theoretical knowledge and skills in practical and research activities; to use the knowledge gained in cellular biotechnology for the assimilation of other biotechnological disciplines, to apply the knowledge gained in practice; work with a microscope, binocular;</p> <p>Have skills in: using botanical microtechnics; preparation of temporary slides; handling laboratory equipment (thermostats, centrifuges, analyzers and specific devices, conducting experiments to study basic physiological processes, determining osmotic pressure, intensity of transpiration, photosynthesis, respiration, chlorophyll release and determining its physicochemical properties and quantity, determining the effect of various mineral elements for the growth and development of plants, individual growth indicators, plant resistance.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; choose a biotechnological object to obtain the target product.</p>
	// BK 3217 Cell biology					<p>// BK 3217 Cell biology</p> <p>Know: the basics of modern trends in the study of cell biology; theoretical and practical foundations of cytological research in biotechnology;</p> <p>Be able to: apply the obtained theoretical knowledge and skills in practical and research activities; to use the knowledge gained on the structure and functions of the cell for the assimilation of other biotechnological disciplines, to apply the knowledge gained in practice; work with a microscope, binocular;</p> <p>Have skills in: using botanical microtechnics; preparation of temporary slides; handling laboratory</p>

						<p>equipment (thermostats, centrifuges, analyzers and specific devices, conducting experiments to study the structure and basic physiological processes.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; choose a biotechnological object to obtain the target product.</p>
CGFR 2218 Cytology, histology and physiology of plants	BD/KV	T3	2	6	<p>CGFR 2218 Cytology, Histology and Plant Physiology</p> <p>Know: the structure and functions of plant cell organelles, the essence and mechanisms of the light and dark phases of photosynthesis, the pathways of oxidation of respiratory substrates, photosynthetic and oxidative phosphorylation, the physiological role of mineral elements and their metabolism in plants, mechanisms of entry into the cell and movement on plant water, mineral elements, patterns of growth and development of plants, physiological foundations of plant resistance. methods of in vitro cultivation of cells, tissues and organs of plants;</p> <p>Be able to: prepare the necessary micropreparations; carry out a morphological and anatomical description of cells, tissues and organs; apply the knowledge gained to further improve the level of theoretical training, as well as in practical activity;</p> <p>Have skills: preparation of culture media for cultivation; work in a laminar box; sterilization of the source material and isolation of explants from it; culturing cells on agar and in liquid medium; subculturing cells and assessing their growth;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; choose a biotechnological object to obtain the target product.</p>	
// BSR 2218 Botany and plant taxonomy					<p>// BSR 2218 Botany and plant taxonomy</p> <p>Know: the internal and external structure of plants, the essence and mechanisms of the light and dark phases of photosynthesis, the main signs of the division of plants into systematic groups;</p> <p>Be able to: prepare the necessary micropreparations; carry out a morphological and anatomical description of organs; determine the species of plants; apply the knowledge gained to further improve the level of theoretical training, as well as in practical activities;</p> <p>Have skills: preparation of culture media for cultivation; work in a laminar box; sterilization of the source material and isolation of explants from it; culturing cells on agar and in liquid medium; subculturing cells and assessing their growth, mounting herbariums;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; choose a biotechnological object to obtain the target product.</p>	
PBioI 4219 Food bioindustry	BD/KV	Exam	7	5	<p>PBioI 4219 Food bioindustry</p> <p>Know: the latest advances in biotechnology in the food industry; the main biotechnological methods of obtaining products useful for humans; traditional biotechnological processes used in the food industry; criteria for the analysis of sustainability and resource conservation in the biopharmaceutical industry;</p>	

						<p>Be able to: conduct theoretical research, use reference and monographic literature in the field of food biotechnology; use the knowledge gained to analyze experimental data related to the selection, characteristics and improvement of biotechnology objects, as well as their use in various technological processes of food production; independently choose technical means, a rational scheme for the production of a given product; evaluate the technological efficiency of production and make proposals for their improvement.</p> <p>Have skills: mastery of the basic concepts of food biotechnology, genetic and cellular engineering, engineering enzymology, necessary for understanding biotechnological production; assessing the prospects of the process (technology) from the standpoint of efficiency.</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; carry out the analysis, planning and management of business activities of business entities.</p> <p>BP // 4219 Fermentation plants</p> <p>Know: biochemical, chemical and physicochemical processes of fermentation, occurring in bioreactors and at the stages of processing associated with the isolation and purification of the target product; selection criteria and equipment for the stages of cultivation, isolation and purification of biosynthesis products;</p> <p>Be able to: characterize raw materials, including non-scarce secondary products and waste from a number of industries; to characterize the stages of obtaining the final food products of biotechnological industries; use the knowledge gained to master other biotechnological disciplines;</p> <p>Have the skills: to obtain starter cultures for the production of various food products, to draw up technological schemes for obtaining food products;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; carry out the analysis, planning and management of business activities of business entities.</p>
	// BP 4219 Fermentation plants					
MB 08 Biotechnology Methods Module	BCh 3220 Biochemistry	БД/КВ	Exam	5	5	<p>BCh 3220 Biochemistry</p> <p>Know: the basic principles of the structural organization of biological macromolecules of proteins, carbohydrates, lipids, nucleic acids; physicochemical properties of amino acids and their role in the formation of the structure and functioning of a protein molecule, the functional role of proteins and nucleic acids in vital processes, the main provisions of enzymatic catalysis, specific properties and kinetic characteristics of enzymes, the role of enzymes in biotechnology, properties and role DNA and RNA in the reproduction and transmission of genetic information, structural features and properties of carbohydrates and lipids, their biological functions;</p> <p>To be able to: use the knowledge of the course "Biochemistry" to master other biological disciplines, to solve practical issues of biotechnology, in particular, engineering enzymology, to isolate polymers, to identify functional groups of organic compounds, natural organic compounds of different classes, to study the properties of natural compounds;</p> <p>Have skills: compliance with safety regulations, handling laboratory glassware and equipment, independent work on educational and special literature; planning and conducting an experiment,</p>

					<p>interpreting its results, acquiring skills in working with enzymes: handling chemical reagents, instruments and equipment; principles and laws for the development and implementation of measures to protect the environment in BT production; development and implementation of measures for the rational use of natural resources and waste disposal in biotechnology;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; choose a biotechnological object to obtain the target product; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
	//Enz 3220 Enzymology				<p>//Enz 3220 Enzymology</p> <p>Know: the basic principles of the structural organization of enzymes; physicochemical properties of amino acids and their role in the formation of the structure and functioning of the enzyme molecule, the functional role of enzymes in the vital processes of the cell, specific properties and kinetic characteristics of enzymes, the role of enzymes in biotechnology;</p> <p>Be able to: use the knowledge of the course to master other biological disciplines, to solve practical issues of biotechnology;</p> <p>Have skills: compliance with safety regulations, handling laboratory glassware and equipment, independent work on educational and special literature; planning and conducting an experiment, interpreting its results, acquiring skills in working with enzymes: handling chemical reagents, instruments and equipment; principles and laws for the development and implementation of measures to protect the environment in BT production;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; choose a biotechnological object to obtain the target product; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
	Gen 3221 Genomics	BD/KV	T3	5	<p>Gen 3221 Genomics</p> <p>Know: the basic terms and provisions of genetics, the laws of inheritance of traits. The current state of the problems of genomics;</p> <p>Be able to: use the conceptual apparatus of science, solve problems on the inheritance of traits;</p> <p>Have skills: in assessing the genetic structure of an individual and population, genetic terminology, electronic genetic databases; methods of genetic engineering;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; to develop design documentation when designing technical objects.</p>
	// GIMR 3221 Genetic engineering of microorganisms and plants				<p>// GIMR 3221 Genetic engineering of microorganisms and plants</p> <p>Know: molecular biological and genetic terminology in the international language; general provisions and approaches of genetic engineering; basic principles of obtaining recombinant DNA; practical aspects of genetic engineering; general provisions and approaches to the creation of in-</p>

						<p>dustrial strains of producers;</p> <p>Be able to: draw up schemes for the design of organisms based on the reunification of DNA fragments in vitro; determine a specific gene responsible for the synthesis of a particular protein in obtaining a mutation;</p> <p>Have skills in: using genetic engineering, which include mutagenesis, hybridization, conjugation, transduction, transformation and fusion of protoplasts; creation of industrial strains based on molecular genetic methods; compliance with safety regulations; planning an experiment and interpreting its results;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; to develop design documentation when designing technical objects.</p>
	SPShP 4222 Creation of industrial strains of producers	BD/KV	Exam	7	5	<p>SPShP 4222 Creation of industrial strains of producers</p> <p>Know: general provisions and approaches to the creation of industrial strains of producers; basic principles of obtaining recombinant DNA; principles of organizing technological processes for creating industrial strains of producers;</p> <p>Be able to: draw up schemes for the design of organisms based on recombinant DNA in vitro; to determine a specific gene responsible for the synthesis of a particular protein in order to obtain it using designed microorganisms;</p> <p>Have skills: creating industrial strains based on molecular genetic methods; compliance with safety regulations; independent work on educational and special literature; planning an experiment and interpreting its results;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; choose a biotechnological object to obtain the target product.</p>
	//BM 4222 Bioengineering of microorganisms					<p>// VM 4222 Bioengineering of microorganisms</p> <p>Know: the structural and functional organization of hereditary material at the genetic, chromosomal and genomic levels; principles of organizing technological processes for creating industrial strains of producers;</p> <p>Be able to: draw up schemes for the design of organisms based on the reunification of DNA fragments in vitro; determine a specific gene responsible for the synthesis of a particular protein in obtaining a mutation;</p> <p>Have skills in: using genetic engineering, which include mutagenesis, hybridization, conjugation, transduction, transformation and fusion of protoplasts; creation of industrial strains based on molecular genetic methods; compliance with safety regulations; independent work on educational and special literature;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes; choose a biotechnological object to obtain the target product.</p>

<i>PD – Major disciplines</i>						
<i>UC – University component</i>						
OBP 09 Module Basic biotechnological production	PAB 4301 Processes and de- vices in biotechnol- ogy	PD/VK	T3	7	5	<p>Know: basic concepts of biotechnological processes; criteria for selecting producers for obtaining food and beverages, for the production of amino acids, enzymes, bacterial fertilizers; basic methods of chemical identification of substances and determination of their reactivity; device and principle of operation of technological equipment, composition and purpose of equipment used in the production process, principles of equipment interchangeability, technological equipment of the dairy industry;</p> <p>Be able to: select equipment, type of producer and conditions for a specific biotechnological process; describe biochemical processes;</p> <p>work with the standards in the field of production, calculate the production capacity and load of equipment, ensure the operation of equipment in the production of dairy products, provide the production process with the necessary material, make proposals for improving the equipment, materials and tools used,</p> <p>Have the skills to: use biotechnology equipment; determine the main characteristics of the composition and properties of dairy products, use modern methods of control of technological operations, the quality of raw materials, semi-finished products and finished products;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to develop design documentation when designing technical objects; choose a biotechnological object to obtain the target product.</p>
	PP2 3302 Industrial practice 2	PD/VK	Exam, report	6	5	<p>Know: technologies for the production of biotechnological products; objects of biotechnology and methods of their improvement; processes and apparatus used in biotechnology;</p> <p>Be able to: independently formulate, define methods and ways of performing professional tasks, collect data to analyze the use and functioning of biotechnological processes;</p> <p>Have skills: culturing cells of microorganisms, plants and animals; work with biotechnological equipment; work with regulatory documents in the field of biotechnology;</p> <p>Be competent: in building a model of professional tasks and meaningful interpretation of the results; in the adaptation and implementation of typical biotechnological processes.</p>
BB 10 Biotechnology and Safety Module	SSTI 4303 Standardization, certification and measurement tech- nology	PD/VK	Exam	7	5	<p>Know: the main goals, functions and principles of technical regulation; methods and means of measurement and control.</p> <p>Be able to: apply terminology in the field of technical regulation, choose certification schemes and fill out certificates of conformity; analyze and comprehend them taking into account the available literature data;</p> <p>Have the skills: application of the knowledge gained in ensuring and controlling the quality of objects of technical regulation;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management.</p>
	OTBZhD 3304 Occupational health	PD/VK	T3	5	5	<p>Know: the main provisions of the Constitution of the Republic of Kazakhstan, legislative and regulatory acts in the field of occupational health and safety, a system of occupational safety stand-</p>

	and safety					<p>ards, regulatory and technical documents on occupational health and safety, industrial sanitation, fire safety, the rights and obligations of an employee and employer in the field of labor protection, the organization of state supervision and public control over labor protection, the labor protection management system in the organization; legislative acts of the Republic of Kazakhstan in the field of emergency situations; theoretical foundations of life safety in the "human-environment" system; the basics of human interaction with the environment and rational conditions of activity; means and methods for increasing the safety and stability of technical means and technological processes; methods for studying the stability of the functioning of production facilities and technical systems in emergency situations; methods of monitoring dangerous and extremely dangerous situations;</p> <p>To be able to: analyze, interpret and correctly apply legal norms on labor protection, organize work on labor protection at the production site and the enterprise as a whole; monitor compliance with the rules of labor protection, electrical and fire safety; to use the means of collective and individual protection from the effects of harmful and hazardous production factors, as well as fire extinguishing means; to model and predict the development of emergency situations, to identify hazards, to recognize and quantify the negative impacts of the habitat, to conduct continuous control and monitoring of the habitat, to develop, plan and implement measures to improve the safety of life and eliminate the negative consequences of exposure to hazardous and harmful factors;</p> <p>Have skills: work with legal acts included in labor protection legislation; effective use of knowledge and skills in the field of occupational health and safety; a comprehensive solution to the problems of ensuring healthy and safe working conditions; scientific analysis of working conditions, causes of injuries and occupational diseases; taking the necessary measures to protect human rights in the field of labor protection; planning and participating in rescue operations; the use of personal protective equipment, protection of a person and the environment from negative influences, planning and participation in rescue operations, the use of individual and collective protection equipment, providing first aid to victims, creating a normal (comfortable) state of the human environment;</p> <p>Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; carry out the analysis, planning and management of business activities of business entities.</p>
	PP 4305 Undergraduate practice	PD/VK	Exam, report	8	5	<p>Know: objects of biotechnology and methods of their improvement; processes and apparatus used in biotechnology; requirements for the implementation, writing of the thesis (project), execution of an explanatory note; key and practically significant provisions on the disciplines of general professional and special training, the procedure for conducting an exam;</p> <p>To be able to: independently formulate, define methods and ways of performing professional tasks, evaluate their effectiveness and quality, collect data to analyze the use and functioning of biotechnological processes; independently solve the assigned tasks; give answers that provide an opportunity for an adequate assessment of knowledge and professional training of future specialists; draw up reporting documentation;</p> <p>Have skills: work with regulatory legal documents in the field of biotechnology; on observance of safety measures and environmental protection at biotechnological enterprises; communication</p>

						skills in the work team; work with literary sources, reference books, regulatory and technical documentation in the field of biotechnology; use in your answer references to the relevant provisions of educational and scientific literature and show your own point of view; Be competent: in building a model of professional tasks and meaningful interpretation of the results; in the adaptation and implementation of typical biotechnological processes.
KB- Component of choice						
ATBP 11 Biotechnological Manufacturing Technology As- pects Module	FB 2306 Phytobiotechnology	PD/KV	Exam T3	4	6	FB 2306 Phytobiotechnology Know: medicinal plants of the main divisions of flowering plants; phytochemical composition of medicinal plants. Be able to: cultivate the cells of medicinal plants on an artificial nutrient medium. Have skills: knowledge of biotechnology methods that are used to create medicines based on medicinal plants. Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to organize the production process, understanding the physico-chemical processes; carry out the analysis, planning and management of business activities of business entities; to use biotechnological methods to protect the environment.
	// AB 2306 Agroindustrial biotechnology			3		

BP 2307 Biotechnology of prokaryotes	PD/KV	Exam	4	6	<p>BP 2307 Biotechnology of prokaryotes Know: the basics of the cultivation of prokaryotes; technological processes for obtaining biomass and products of fine microbiological synthesis; requirements for raw materials and final products; Be able to: work with cultures of microorganisms; determine the purity and activity of cultures and preparations; control the growth of producers; to use knowledge about biotechnology of microorganisms in practice; Have skills: planning and conducting an experiment, interpreting its results, solving biotechnological problems of a calculated and theoretical nature; taking the test material and delivering it to the bacteriological laboratory; Be competent: to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; carry out the analysis, planning and management of business activities of business entities; carry out the analysis, planning and management of business activities of business entities; to possess cognitive linguoculturological complexes for solving professional tasks; controls the biotechnological processes during the production of the target product.</p> <p>// IB 2307 Innovative biotechnology Know: the possibility of using microbes in the production of biologically active substances; about the kingdom of viruses, their use in the production of antiviral vaccines; Be able to: apply the basic principles of biotechnology, various types of bioreactors used to clean objects of the external environment; use the capabilities of micro-organisms for wastewater treatment, biogas production and environmental health; Have skills: use of microorganisms in various biotechnological processes and industries; Be competent to apply in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; carry out the analysis, planning and management of business activities of business entities; to develop design documentation when designing technical objects.</p>
AKBP 2308 Aspects of contamination of biotechnological industries	PD/KV	Exam	4	6	<p>AKBP 2308 Aspects of contamination of biotechnological industries Know: the basics of asepsis; the main classes of drugs for the prevention and control of microbiological contamination; methods of disinfection and sterilization of biotechnological production facilities; personal hygiene rules for employees of biotechnological industries; instructions for sanitary and technical control of production; Be able to: carry out aseptic measures in biotechnological industries; Have the skills to: apply basic aseptic techniques; prepare disinfectant solutions; observance of personal hygiene of workers of biotechnological industries; Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
// BioB 2308 Biosecurity					<p>// BioB 2308 Biosecurity Know: the basics of microbiological safety; main classes of drugs for prevention and control of microbiological pollution; methods of disinfection and sterilization of biotechnological production facilities; personal hygiene rules for employees of biotechnological</p>

						<p>industries; Be able to: carry out activities to prevent microbiological contamination in biotechnological industries; Have the skills to: apply the basic methods of ensuring microbiological safety; prepare disinfectant solutions; observance of personal hygiene of workers of biotechnological industries; Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
BTP 12 Biotechnology in Manufacturing Module	BioE 4309 Bioenergy	PD/KV	Exam	8	5	<p>BioE 4309 Bioenergy Know: methods of genetic engineering in modern biotechnology, basic concepts, theories and laws of bioenergy; classification, methods of work of bioenergy; Be able to: work with cultures of microorganisms; to use knowledge about biotechnology of microorganisms in practice; apply the knowledge gained to develop and obtain various types of bio-fuels; Have skills: experimental work and compliance with safety regulations; observation and interpretation of experimental data; application of fundamental knowledge to solve theoretical and applied problems; Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; perform calculations in the design/organization of production processes. // BioI 4309 Bioinformatics Know: the basic hardware and software for the implementation of information technologies used in bioinformatics; principles of working with molecular biological databases and their supporting applications; methods of efficient search and processing of information about the sequences and structures of biopolymers; basic principles of molecular modeling; the latest achievements in the field of bioinformatics and the prospects for their practical and theoretical use .; Be able to: organize information search in databases and use the capabilities of software and network technologies for molecular biological research; to select the most optimal information and computational research method depending on the task; use basic technologies and methods of molecular imaging; Have skills: possession of methods and means of analysis of molecular biological information; work with biological databases and applications serving them; Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
	//BioI 4309 Bioinformatics					
	PBP 4310 Design of biotechnological production	PD/KV	Exam	8	6	<p>PBP 4310 Design of biotechnological industries Know: the concept of biotechnological production; biochemical, chemical and physicochemical processes occurring in bioreactors and at the stages of processing associated with the isolation and purification of the target product; drawing up an act of raw materials, GOST and technical condi-</p>

						<p>tions for the acceptance of dairy products, the procedure and rules for the acceptance of milk, regulatory technological documentation for the technology of production of dairy products;</p> <p>Be able to: apply the methodology of technological design to the development of a course project; to develop technological and hardware schemes for biotechnological production; use regulatory and production documentation; maintain document circulation and reporting documentation on the acceptance of raw materials, provide the production process with visual technological documentation, read and execute design and technological documentation, organize work on the technology for the production of dairy products, draw up technical and technological documentation in the prescribed form;</p> <p>Have skills: research activities; work in the AutoCAD environment, Compass 3D; performing calculations using the Excel, MathCAD application packages; execution of reports and acts in technological documentation;</p> <p>Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; to develop design documentation when designing technical objects; choose a biotechnological object to obtain the target product.</p>
	// RB 4310 Regenerative biotechnology					<p>// RB 4310 Regenerative Biotechnology</p> <p>Know: strategic biomedical approaches to the creation of diagnostic and medicinal products by methods of medical biotechnology; fundamentals of industrial production of basic modern dosage forms used in practical health care, including hormones, interferons, interleukins, antibiotics, antibodies, vaccines;</p> <p>Be able to: apply the knowledge gained in practice; work with protein preparations: perform operations for the isolation, purification and certification of proteins; carry out the basic operations of genetic engineering; perform a set of operations related to hybrid technology; be able to obtain monoclonal antibodies, identify and certify them; carry out the necessary work on preclinical testing of the biological activity of drugs prepared by biotechnological methods;</p> <p>Have skills: handling microscopic equipment; handling laboratory equipment (thermostats, centrifuges, analyzers and specific instruments), as well as surgical instruments;</p> <p>Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; develop a feasibility study of proposals for the introduction of new biotechnologies for the food industry.</p>
	ZooB 4311 Zoobiotechnology	PD/KV	T3	7,8	6	<p>ZooB 4311 Zoobiotechnology</p> <p>Know: general biological foundations of animal biotechnology; experimental approaches to cell and embryological engineering; principles of cloning and genetic transformation of somatic and germ cells of animals;</p> <p>Be able to: use theoretical knowledge for implementation in science and practice; competently plan experiments in animal biotechnology;</p> <p>Have skills: research activities; handling of the main animal objects - fruit fly, mouse, rabbit, sheep;</p> <p>Be competent: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environ-</p>

	// VB 4311 Veterinary biotechnology					<p>mental management; carry out the analysis, planning and management of business activities of business entities; to develop design documentation when designing technical objects; to use biotechnological methods to protect the environment .</p> <p>// VB 4311 Veterinary biotechnology</p> <p>Know: general biological foundations of veterinary biotechnology; experimental approaches to cell and embryological engineering; principles of cloning and genetic transformation of somatic and germ cells of animals;</p> <p>Be able to: use theoretical knowledge for implementation in science and practice; competently plan experiments in veterinary biotechnology;</p> <p>Have skills: research activities; handling of the main animal objects - fruit fly, mouse, rabbit, sheep;</p> <p>Be competent in: in professional activities the main provisions of the Constitution and legislation of the Republic of Kazakhstan in the field of combating corruption and the principles of environmental management; carry out the analysis, planning and management of business activities of business entities; to develop design documentation when designing technical objects.</p>
<i>FE - final examination</i>						
IA 13 Module Final Attestation	NZDR (P) 4501 Writing and defending a thesis (project) or preparing and passing a comprehensive exam	FE	Defending a thesis (project) or passing a comprehensive exam	8	12	<p>Know: methods of obtaining new objects of biotechnology; biotechnological methods of environmental protection; technological schemes for obtaining biotechnological products; fundamentals of biotechnology; the use of processes and devices in biotechnological production; application of biotechnological objects in food biotechnology.</p> <p>Be able to: analyze, systematize and generalize research results; use methods, evaluation criteria and methods for determining the development strategy in the research area; use biotechnological processes and devices in the production of the target product.</p> <p>Have skills: conducting independent work and mastering the methodology of scientific research and experimentation in solving developed problems and issues; work with objects of biotechnology, the use of biotechnological processes in production.</p> <p>Be competent: in the methodology for analyzing the subject area; in the application of the acquired knowledge in solving specific scientific, technical and production problems.</p>

4. Summary table reflecting the volume of disbursed loans in the context of modules of the educational program:

Course of Study	Semester	Number of learned modules	Number of students studied disciplines			Amount of credits										Total in hours	amount	
			OK	VK	KV	Theoretical teaching	Training practice	Teaching and educational practice	Psychological and pedagogical practice	Teaching practice	Production practice	Undergraduate practice	The final certification	Total	Exam		Dif. offset (KP, KR)	
1	1	4	5	2	-	30								30	900	5	2	
	2		3	2	2	30	5							30	900	5	2	
2	3	6	3	3	1	30								30	900	5	2	
	4		2	1	4	30				5				30	900	6	1	
3	5	8	-	3	3	32								30	900	4	2	
	6		-	3	3	30				5				30	900	4	2	
4	7	7	-	3	3	30								30	900	4	2	
	8		1	1	3	18					5	12	30	900	3	1		
Total:		13	14	18	19	228	5				10	5	12	240	7200	36	14	

1 DEVELOPED

Compiled by:

Ф.И.О., должность:

Derbush S.N., c.b.s., Associate Professor

2 DISCUSSED

2.1 At a meeting of the Department of ChChT

Minutes dated "___" _____ 20___, No. ___

head of the department ChChT _____ Takibayeva A.T.

2.2 At the meeting of the Educational and Methodological Council of the FIT

Minutes dated "___" _____ 20___, No. ___

Chairperson _____ Savchenko N.K.