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NON-PROFIT JOINT-STOCK COMPANY  
KARAGANDA TECHNICAL UNIVERSITY

«AGREED»  
Director  
of the branch «RSE KPMS RK»  
«Chemical and Metallurgical Institute named after  
Zh.Abishev»  
d.t.s, professor, Laureate Prize of the  
RK  
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"APPROVED" by the  
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Protocol № 13 of 29.04.2021  
Chairman of the Management Board-Rector  
M. K.Ibatov

MODULAR EDUCATIONAL PROGRAM

In the field of training 6B071 « Engineering »

6B07110 « Chemical technology of organic substances»

Level: Bachelor's Degree

The degree awarded is – « Bachelor of Engineering and Technology»

Karaganda 2021

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the Modular educational program  
6B07110 " Chemical technology of organic substances»

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## Introduction

The modular educational program 6B07110 "Chemical technology of organic substances" is developed on the basis of the following regulatory documents:

The Law of the Republic of Kazakhstan "On Education" dated 27.07.2007 No. 319-III of the SAM, with amendments and additions dated 31.03.2021 No. 24-VII.

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 No. 595 of 30.10.2018, with amendments and additions No. 539 of 24.12.2020).

State Mandatory Standards of Education (SES) of all levels of education (Order of the Minister of Education and Science of the Republic of Kazakhstan dated 31.10.2018 No. 604, with amendments and additions dated 05.05.2020 No. 182).

Rules of the organization of the educational process on credit technology of training (Order of the Minister of Education and Science of the Republic of Kazakhstan dated 20.04.2011 No. 152, with amendments and additions dated 12.10.2018 No. 563).

The qualification directory of positions of managers, specialists and other employees, approved by the order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated 30.12.2020 No. 553-o-m.

The modular educational program is a comprehensive 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 evaluating students' educational achievements.

## **1 Objectives of the Modular educational Program**

The application of this Modular Educational Program provides for the achievement of the following goal:

- training of specialists for the organization of production processes in the chemical industry
- to implement in practice the democratic principles of educational process management, to expand academic freedom and opportunities of 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;
- provide 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.

## **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 of "Bachelor of Engineering and Technology".

Qualifications and positions are determined in accordance with the "Qualification Directory of positions of managers, specialists and other employees", approved by the order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated 21.05.2012 No. 201-o-m, with amendments and additions dated 17.04.2013 No. 163-o-m.

### **2.2 Qualification characteristics of the graduate**

#### **2.2.1 Field of professional activity**

The field of professional activity of graduates is: oil refining, petrochemistry, polymer processing, geology, hydrogeology, mining, science and education.

#### **2.2.2 Objects of professional activity**

The objects of professional activity of graduates are: enterprises for the production of organic substances, for the processing of oil, gas, coal and polymers, elastomers, paint and varnish materials, gunpowders, solid and liquid rocket fuels, for the preparation, production and transportation of hydrocarbon raw materials and their rational use; research and design industry institutes; secondary technical educational institutions; defense enterprises, mining industries.

#### **2.2.3 Subject of professional activity**

The subjects of professional activity of graduates are: products of basic and fine organic synthesis, polymers, devices and equipment of chemical technology of production and processing of organic substances and materials, various types of raw materials and auxiliary materials and substances (including oil, gas, coal, vegetable raw materials), polymers, monomers, elastomers chemical reagents and reagents, research instruments and equipment.

### 2.2.4 Types of professional activity

"Bachelor of Engineering and Technology" in the educational program 6B07110 "Chemical technology of organic substances" can perform the following types of professional activities:

*production and technological activities:* solving issues of professional activity; ability to independently develop design and estimate documentation of buildings, structures and their complexes; ability to use graphic and computer programs; be able to work professionally with special, regulatory and scientific literature; flexibility and mobility in various conditions and situations related to professional activity;

*organizational and managerial activities:* the ability to make production and technical decisions and organize work in a team and management taking into account technical, financial, psychological factors; knowledge of architectural, construction, special and scientific terminology and professional rhetoric; the ability to work in a team, offer new solutions, correctly defending their point of view; the ability to find compromise solutions, correlating their opinion with the opinion of the team, the desire for professional and personal growth;

*design activity:* the ability to develop design and estimate documentation of buildings and structures and their complexes; the ability to develop design and estimate documentation of landscape and urban development objects; the ability to make decisions to ensure the functional organization of design solutions, aesthetics and harmony of the designed objects; to be able to model design solutions, assess problems and trends in the field of architecture;

*scientific and pedagogical activity:* work in scientific and educational organizations.

### 2.2.5 Functions of professional activity

The main functions of the professional activity of graduates are:

- organizational and technological support;
- production and management;
- project documentation;
- research and development;
- educational, pedagogical.

### 2.2.6 Areas of professional activity

Areas of professional activity include:

Organizational and technological activities:

- organization and implementation of input control of raw materials from the point of view of the possibility of production and processing of organic substances;

- evaluation of the composition and properties of the feedstock in order to develop new technological processes that ensure high quality;

- analysis of ways to improve and modernize technological equipment, equipment for the purpose of conducting highly efficient technological processes for the production and processing of organic substances;

Production and management:

- organization of the work of the team in the conditions of the current production;

- implementation of technical control;
- conducting a technical and economic analysis of production.

Project activities:

- design of new and modernization of existing technological schemes, selection of technological parameters, calculation of equipment selection;
- development of design and estimate documentation that ensures the effectiveness of design solutions;
- analysis and evaluation of alternative variants of the technological scheme of individual units based on the extensive use of mathematical models.

Research activities:

- planning and conducting scientific research in the field of chemical technology of organic substances;
- modeling and optimization of production plants and technological schemes;
- analysis of scientific and technical literature and conducting a patent search.

Educational (pedagogical) activity:

- training of young people in chemistry and technology of organic substances processing;
- education of the young generation in teaching and production activities.

### 3. Map of the Modular educational program

Module code and name	Code and name of the discipline	Cycle / component	Control form	Semester	Volume of loans ECTS	Emerging competencies
GES - General education subjects						
RC-required component						
GES 01 Module General education disciplines 1	MHOK1101 Modern history of Kazakhstan	GES/RC	State Exam	1	5	<p><b>To know:</b> objective historical knowledge about the main stages of the history of modern Kazakhstan; to direct students ' attention to the problems of the formation and development of statehood and historical and cultural processes.</p> <p><b>Be able to:</b> demonstrate knowledge of the main periods of the formation of the independent Kazakh statehood; analyze the features and significance of the modern Kazakh model of development; determine the practical potential of intercultural dialogue and respect for the spiritual heritage.</p> <p><b>Have skills:</b> systematization of historical knowledge about the main events of modern history, forming a scientific worldview and civic position.</p> <p><b>Be competent:</b> in possession of cognitive linguistic and cultural complexes for solving professional tasks at the level of basic sufficiency.</p>
	Phil 2102 Philosophy	GES/RC	Exam	3	5	<p><b>To know:</b> the subject, functions, main sections and directions of philosophy; actual problems of modern domestic and world philosophy.</p> <p><b>Be able to:</b> use the positions and categories of philosophy to evaluate and analyze various social trends, facts and phenomena;</p> <p><b>Have skills:</b> apply the acquired knowledge in life situations and in the analysis of social phenomena.</p> <p><b>Be competent:</b> in the main philosophical problems and directions in philosophy, in the main methods and approaches in the study of philosophical problems of our time.</p>
	Fl 1103 Foreign language	GES/RC	Exam	1, 2	10	<p><b>To know:</b> 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 framework of the achieved level in accordance with the Pan-European Scale of levels of Foreign Language Proficiency.</p> <p><b>Be able to:</b> implement their knowledge, skills and practical experience in the course of interaction with representatives of a different culture.</p> <p><b>Have skills:</b> of: oral and written foreign language speech 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 (Common European Framework of References for Languages).</p> <p><b>Be competent:</b> in possession of cognitive linguistic and cultural complexes for solving</p>

						professional tasks at the level of basic sufficiency.
	K(R)I 1104 Kazakh (Russian) language	GES/RC	Exam	1,2	10	<p><b>To know:</b> functional styles of speech, the scope of their use, the main stylistic features and language features, features of oral and written business communication; composition and requirements for the language of public speech, features of oral public speech, lexical and grammatical units based on information and training texts; differences and features of written and oral types of business and scientific styles; norms of the literary language, definitions of the text, the main idea, topic and paragraph of the text; history, literature, customs, traditions of the Kazakh people; the main speech thematic-composite types: monologue-description, monologue-reasoning, monologue-presentation, monologue-analysis, dialogue-story; types of speech activity in accordance with the level of training; rules of language proficiency in various situations of everyday, socio-cultural, professional communication; types of production of oral and written speech in accordance with the communicative purpose and professional sphere of communication.</p> <p><b>Be able to:</b> analyze the structural and semantic organization of the text; determine the linguistic means of organizing the text; analyze the structural and semantic features of texts of different styles; work with texts of different styles and genres based on the implementation of a system of tasks and training exercises; make the right choice of language and speech means for solving certain problems of communication and cognition based on knowledge of a sufficient volume of vocabulary, grammatical knowledge, pragmatic means of expressing intentions; to convey the factual content of the texts, to formulate their conceptual information, to describe the inference knowledge (pragmatic focus) of both the entire text and its individual structural elements, to interpret the information of the text, to explain the style and genre specifics of the texts of the socio-cultural, socio-political, official-business and professional spheres of communication within the scope of the certification requirements.</p> <p><b>Have skills:</b> expressing your opinion: making a monologue-description, organizing a conversation, disputing; developing the ability to speak, use professional vocabulary; requesting and communicating information in accordance with the communication situation; evaluating the actions and actions of participants, using information as a tool to influence the interlocutor in situations of cognition and communication in accordance with the certification requirements; building a program of speech behavior in situations of personal, social and professional communication in accordance with the norms of language, culture, specifics of the field of communication, certification requirements.</p> <p><b>Be competent:</b> in possession of cognitive linguistic and cultural complexes for solving professional tasks at the level of basic sufficiency.</p>
	ICT 1105 Information and communication technologies	GES/RC	Exam	1	5	<p><b>To know:</b> economic and political factors contributing to the development of information and communication technologies; features of various operating systems; architecture, be able to calculate and evaluate the performance indicators of super-computers.</p> <p><b>Be able to:</b> 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</p>

						<p>protection; design and create simple websites; process vector and bitmap images; create multimedia presentations.</p> <p><b>Have skills:</b> use various social platforms for communication, various forms of e-learning to expand professional knowledge; use various cloud services.</p> <p><b>Be competent:</b> when making calculations in the design / organization of production processes</p>
	<p>SPK (SPSCSP)2106 Module of socio-political knowledge (sociology, political science, cultural studies, psychology)</p>	GES/RC	Exam	3,4	8	<p><b>To know:</b> the 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, the role theory of personality. The essence, possibilities, boundaries and prospects of politics, the system and functions of political power, political regimes and institutions, the 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 the main conceptual approaches. The main categories and concepts of psychological science; the main functions of the psyche; the basics of personality psychology; the laws of human mental development.</p> <p><b>Be able to:</b> to analyze and evaluate the social phenomena occurring in the society. To consider politics as one of the forms of human activity for the organization of modern society, to interact with state structures, to formulate their own interests and express them through the structures of civil society, to apply political knowledge to solving professional problems, to cultivate leadership qualities, to strive for the worthy performance of their civic and professional duty. To use the general cultural and moral-ethical heritage in professional activity. Evaluate the place of culture in a person's life. To diagnose individual psychological and personal characteristics of people, styles of their cognitive and professional activities; to use psychological knowledge to solve research and practical problems.</p> <p><b>Have skills:</b> preparation and organization of a specific sociological study. 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; to search and analyze the necessary information, to assess its significance, to use it in the decision-making process. The main general humanitarian categories, the method of analyzing socio-cultural processes, the skills of caring for cultural values and socio-cultural openness. Operate with the main categories of psychological knowledge; evaluate the level of formation of mental processes.</p> <p><b>Be competent:</b> in the knowledge of the basic concepts and theories of sociology, methodology and methodology of sociological research; the history of political thought, about modern political institutions, their structure and functioning, about the rights, freedoms and duties 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 competencies: the ability and willingness to carry out their activities in various spheres of public life, taking into account the moral and legal norms accepted in society; the ability and willingness to understand the role of art, to strive for aesthetic development and self-improvement, to respect and cherish historical heritage and cultural traditions, to tolerate social and cultural differences, to understand the diversity of cultures and civilizations in their interaction. In the field of analysis of</p>

						the features of psychological institutions in the context of their role in society; technologies for conflict prevention.
	PC 2107 Physical Culture	GES/RC	Exam	1,2,3,4	8	<p><b>To know:</b> the role of physical culture in human development and specialist training; fundamentals of the state policy of the Republic of Kazakhstan in the field of physical culture and sports.</p> <p><b>Be able to:</b> use in life practical skills and abilities that ensure the preservation and promotion of health, the development and improvement of psychophysical abilities and qualities; apply the rules for the safe conduct of physical exercises and sports.</p> <p><b>Have skills:</b> possess health-saving skills; master the technique and tactics of the chosen sport; assist in organizing competitions and judging.</p> <p><b>Be competent:</b> in the control and management of physical and functional fitness</p>
<b>UC-University component</b>						
GES 02 Module General education subjects 2	FLEFAC 3108 Module Fundamentals of Law, Ecology, Fundamentals of anti-corruption Culture	GES/UC	Exam	5	5	<p><b>To know:</b> 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 public administration bodies and the scope of their powers, the mechanism of interaction between substantive and procedural law. Basic patterns of interaction between nature and society; fundamentals of ecosystem functioning and biosphere development; the impact of harmful and dangerous factors of production on the environment and human health; the concept, strategies for sustainable development and practical approaches to their solution at the global, regional and local levels; the basics of legislation on environmental protection; the principles of organizing safe production processes. The essence of corruption and the reasons for its origin, the measure of moral and legal responsibility for corruption offenses, the current legislation in the field of anti-corruption.</p> <p><b>Be able to:</b> 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, protect their rights and interests. To assess the ecological state of the natural environment; to assess the technogenic impact of production on the environment; to critically comprehend the trends in the development of ecological and economic systems related to the use of natural resources and to characterize their environmental 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.</p> <p><b>Have skills:</b> conducting discussions on legal issues, on the application of norms in the modern period, legal analysis of various documents. Assessment of ecosystem components; determination of optimal conditions for sustainable development of ecological and economic systems, including production processes; finding solutions to environmental problems and optimal ways of rational use of natural resources; knowledge of standard methods of environmental monitoring. Analyze situations of conflict of interest and moral choice.</p> <p><b>Be competent:</b> in matters of law, its use in life, in practice and employment. In matters of environmental management; in the overall assessment of the production process from the point of view of the impact on the environment; in the selection of environmentally friendly technologies</p>

						and equipment for production processes. In matters of the causes and origin of corruption, the nature and factors of corruption and its various manifestations.
<b>BD-Basic disciplines</b>						
<b>UC-University component</b>						
NS 03 Natural Sciences Module	Math 1201 Mathematics	BD/UC	Exam	1	5	<p><b>To know:</b> 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 organic matter technology.</p> <p><b>Be able to:</b> apply mathematical methods for analyzing biotechnological and chemical processes; use mathematical tools for calculating optimal parameters in biotechnology and organic matter technology.</p> <p><b>Have skills:</b> create a mathematical model of the situation, analyze and transform it, interpret the results; apply the methods of theoretical and applied research in solving problems of biotechnology and technology of organic substances.</p> <p><b>Be competent:</b> when making calculations during the design / organization of production processes.</p>
	Ph 1202 Physics	BD/UC	Exam	2	5	<p><b>To know:</b> the main 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; the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty.</p> <p><b>Be able to:</b> to use modern physical principles in those areas of technology in which students specialize; to formulate the laws of physics; to determine the quantities that describe phenomena and laws; to establish a connection between them (to express this connection analytically, graphically, in words); to state the basic theoretical and experimental material with explanations and examples; to apply the basic laws and principles of physics in standard situations; to build a model of a physical phenomenon with an indication of the scope of application.</p> <p><b>Have skills:</b> conducting experimental scientific studies of physical phenomena by: planning the experiment (partially); recording the measurement results; processing and evaluating the results obtained when solving problems and conducting the experiment; compiling tables and graphs; evaluating the accuracy of the experiments with theoretical data.</p> <p><b>Be competent:</b> in the organization of the production process, understanding the physico-chemical processes .</p>
	EP 1203 Educational practice	BD/UC	Exam, report	2	5	<p><b>To know:</b> computer programs used in various fields of chemistry and chemical technology; about enterprises by profile.</p> <p><b>Be able to:</b> perform calculations, write reactions in chemistry, formalize the results of work to assess knowledge in various disciplines related to professional activity.</p> <p><b>Have skills:</b> work with the ChemOffice 7.0 program and the knowledge acquired during the study of the courses "Introduction to the specialty" and "Chemistry", preparing students for in-depth study of special educational disciplines.</p> <p><b>Be competent:</b> in the knowledge when working with applied computer programs necessary for the study of disciplines for use in various fields of chemistry and chemical technology.</p>

PLE 04 Professional Languages and Entrepreneurship Module	FE 2204 Fundamentals of Economics	BD/UC	Exam	3	5	<p><b>To know:</b> the laws of the development of economic processes; the main 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><b>Be able to:</b> to systematize knowledge about the essence and forms of manifestation of economic phenomena and processes; to apply in practice the methods of scientific knowledge of economic phenomena and laws; to understand and determine the place of property relations in the economic system.</p> <p><b>Have skills:</b> an interdisciplinary approach to solving economic problems; to acquire knowledge for lifelong professional development.</p> <p><b>Be competent:</b> in the implementation of the analysis, planning and conduct of business activities of economic entities.</p>
	EEMBP 4205 Engineering Entrepreneurship Marketing and Business planning	BD/UC	Exam	7	6	<p><b>To know:</b> methods of generating entrepreneurial ideas; fundamentals of building a business model; methodology for developing a business plan for an innovative project and evaluating its effectiveness; fundamentals of commercialization of scientific and technical developments; fundamentals of investing and creating a new business; business infrastructure; legal aspects of business 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 of developing individual sections of the business plan and the sources of their information support; ways to promote the business plan to the market and receive investments; legal aspects of business planning.</p> <p><b>Be able to:</b> find or generate commercially promising scientific and technical ideas; conduct market research to identify commercially promising niches for product implementation; develop business models and transform them into business plans; create interdisciplinary teams; promote an innovative project; assess risks; present their results; choose the optimal structure of a business plan depending on its type and purpose; promote the business plan to the market, find investors; assess the risks and cost-effectiveness of the business plan being developed; present a business plan to potential investors.</p> <p><b>Have skills:</b> creative thinking and generation of promising scientific and technical ideas; forecasting of economic development trends and identification of promising trends; business modeling and business planning; project management; team building and teamwork; risk management; public speaking; successful presentation; generation of 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 product; calculation of financial indicators; creating a business plan summary; attracting investors' attention to the business plan and its successful presentation.</p> <p><b>Be competent:</b> in the implementation of the analysis, planning and conduct of business activities of economic entities.</p>
	POK(R)/FL 3206 Professionally-	BD/UC	Exam	6	5	<p><b>To know:</b> 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; fundamentals of business communication;</p>

	oriented Kazakh (Russian) /foreign language					<p>scientific vocabulary and scientific constructions of a technical profile; rules for the production of a scientific text and language design; speech norms of the technical sphere of activity; the basics of business communication; the specifics of oral and written speech in the fields of professional, scientific, socio-political communication; national and cultural features of the construction and organization of a text in a foreign language within professionally-conditioned situations; stylistic features of the vocabulary of a foreign language in the field of professional communication.</p> <p><b>Be able to:</b> generalize and interpret scientific and technical information; use the basic techniques of information processing of oral and written text; choose language tools in accordance with the communicative intention and the situation of communication;</p> <p>use etiquette forms of scientific and professional communication; clearly express their point of view on a scientific problem in the Kazakh language. to summarize and interpret scientific and technical information; to use the basic techniques of information processing of oral and written text; to choose language means in accordance with the communicative intention and the situation of communication; to use the etiquette forms of scientific and professional communication; to clearly state their point of view on a scientific problem in Russian. to carry out professional activities in the linguistic, sociolinguistic, information-analytical and communicative aspects; to build their verbal and non-verbal behavior in the areas of professional and scientific social and political communication; to apply a variety of language and speech tools adequately to social factors, the communication situation, the status of the interlocutor and his communicative intentions; organize speech activity in accordance with the tasks of communication, the speech situation, the personal characteristics of the partner as a representative of another culture and the nature of the flow of communication.</p> <p><b>Have skills:</b> production of secondary scientific texts: abstracts, theses, summaries, abstracts, reports; independent search for scientific and technical information as the basis of professional activity; free presentation of their thoughts in oral and written form on professionally significant topics; have the skills to prepare messages, reports on professional topics, production of secondary scientific texts: annotations, theses, summaries, abstracts. reports; independent search for scientific and technical information as the basis of professional activity; free presentation of their thoughts in oral and written form on professionally relevant topics; have the skills to prepare messages, reports on professional topics, 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 (Common European Framework of References for Languages).</p> <p><b>Be competent:</b> in possession of cognitive linguistic and cultural complexes for solving professional tasks at the level of basic sufficiency.</p>
PO 05 Professional-oriented module	ChOC 2207 Chemistry of organic compounds	BD/UC	Exam	4	5	<p><b>To know:</b> basic provisions of the laws of chemistry; development of the theory of the nature of organic compounds; classification, nomenclature and properties; chemical composition; basic processes of chemical organic technology; general laws of the course and mechanism of chemical processes in the synthesis of organic compounds.</p> <p><b>Be able to:</b> in compliance with the safety regulations, properly handle laboratory utensils and equipment, plan and conduct experiments, interpret the results, solve chemical problems of a</p>

						<p>computational and theoretical nature; independently work on educational and special literature.</p> <p><b>Have skills:</b> mastering the theoretical foundations of organic production technology the basic rules of working in a chemical laboratory; applying the knowledge gained to solve specific theoretical and technological problems of conducting experiments in compliance with safety regulations; conducting scientific research in the field of technology for the production and processing of polymers, processing of oil, gas and coal, processing and analysis of the results obtained.</p> <p><b>Be competent:</b> in the organization of chemical production for the production of organic substances</p>
	IS 1208 Introduction to the specialty	BD/UC	Exam, Test tasks	2 1	5	<p><b>To know:</b> fundamentals of the production of organic substances: chemical processing of fuel, wood, production of fats and alcohols; to form the basic concepts and definitions of the technology of organic substances and apply the knowledge gained for the study of subsequent disciplines in the specialty.</p> <p><b>Be able to:</b> use the basic laws of natural science disciplines in professional activities, apply methods of mathematical analysis and modeling, theoretical and experimental research.</p> <p><b>Have skills:</b> compliance with safety regulations; handling of laboratory utensils and equipment, independent work on educational and special literature; planning and conducting an experiment, interpreting its results, solving chemical problems of a computational and theoretical nature; possession of basic methods, methods and means of obtaining, storing, processing information, working with a computer as a means of information management.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances .</p>
	TPHRM 3209 Technology of processing of hydrocarbon raw materials	BD/UC	Exam	5,6	10	<p><b>To know:</b> basic processes of chemical technology; chemical composition of oil, gas and coal; characteristics of the main processes of the petrochemical industry; basic chemical and physico-chemical laws of the course of the catalytic processes of oil, gas and coal processing; theoretical foundations of the process of catalytic cracking and catalytic reforming.</p> <p><b>Be able to:</b> in compliance with the safety regulations, properly handle laboratory utensils and equipment, plan and conduct experiments, interpret the results, solve chemical problems of a computational and theoretical nature; independently work on educational and special literature.</p> <p><b>Have skills:</b> mastering the theoretical foundations of the technology of production of petrochemical synthesis products, methods of processing oil, gas and coal, polymers and elastomers, the basic chemical properties of elements and their compounds, the basic rules of work in a chemical laboratory; applying the knowledge gained to solve specific theoretical and technological problems of the coal and oil and gas processing industry.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p>
	PP1 2210 Production practice 1	BD/UC	Exam, report	4	5	<p><b>To know:</b> chemical properties of the main classes of organic substances and methods of their synthesis; methods for isolating the main and by-products of an organic reaction; the main types and designs of reactors for conducting organic reactions.</p> <p><b>Be able to:</b> collect data describing production and technical, environmental, ergonomic, socio-economic and other indicators of production, apply advanced methods of performing production processes, including from the point of view of chemical technology.</p> <p><b>Have skills:</b> determination of the structure of organic compounds by physico-chemical methods and their quantitative analysis; methods for conducting kinetic research and constructing kinetic models of organic reactions based on experimental data; methods for determining the parameters</p>

						<p>of mathematical models of reactors based on experimental data.</p> <p><b>Be competent:</b> in technology and general principles of implementation of the most common chemical processes of processing natural energy carriers and obtaining carbon materials.</p>
<b>CCh-Component of choice</b>						
MSCh 06 Module Main sections of chemistry	Chem 1211 Chemistry	BD/CCh	Exam	2	6	<p><b>Chem 1211 Chemistry</b></p> <p><b>To know:</b> basic laws of chemistry; classification and properties of inorganic compounds; atomic structure, nature of chemical bonds; systematics of chemical elements; thermochemistry and thermodynamics, solutions, redox reactions, and electrochemistry.</p> <p><b>Be able to:</b> classify data, determine the type of problem, make an algorithm for its solution; make equations of electrolytic dissociation, molecular and ionic equations of exchange reactions, hydrolysis, write equations of redox reactions, evaluate the probability of a reaction by its thermodynamic parameters.</p> <p><b>Have skills:</b> conducting experiments and laboratory work in compliance with safety regulations; planning and conducting an experiment, interpreting its results, solving chemical problems of a computational and theoretical nature, independently working on educational and special literature and using dictionaries when writing term papers and theses.</p> <p><b>Be competent:</b> in the organization of the production process, understanding the physico-chemical processes.</p> <p><b>//IChem 1211 Inorganic chemistry</b></p> <p><b>To know:</b> basic definitions and laws of chemistry; classification, nomenclature and properties of inorganic compounds; atomic structure and systematics of chemical elements; modern theory of chemical bonding; general laws of chemical processes, thermochemistry, thermodynamics, the doctrine of solutions, redox reactions and electrochemistry.</p> <p><b>Be able to:</b> classify the data, determine the type of problem, make an algorithm for its solution; make equations of electrolytic dissociation, molecular and ionic equations of exchange reactions, hydrolysis, equations of redox reactions, radioactive decay; write down the expression for the equilibrium constant in solutions and heterogeneous systems, evaluate the probability of the reaction by its thermodynamic parameters.</p> <p><b>Have skills:</b> in compliance with safety regulations; handling laboratory utensils and equipment, planning and conducting experiments, interpreting its results, solving chemical problems of a computational and theoretical nature, independent work on educational and special literature, using dictionaries when writing term papers and theses.</p> <p><b>Be competent:</b> in the organization of the production process, understanding the physico-chemical processes</p>
	//IChem 1211 Inorganic chemistry					

	<p>ACChem 2212 Analytical Chemistry</p> <hr/> <p>//ChA 2212 Chemical analysis</p>	BD/CCh	Course work	3	5	<p><b>ACChem 2212 Analytical Chemistry</b>  <i>To know:</i> qualitative and quantitative analyses; analysis of all groups of ions in the periodic table, concepts of solutions, concentration, pH of the medium, titer, buffer solutions.  <i>Be able to:</i> perform qualitative and quantitative analysis. Master the methods of volumetric analysis: titration, coulometry, permanganatometry, iodometry.  <i>Have skills:</i> when working with laboratory equipment, basic devices and methods of physical and chemical measurements that have been used in practice; in conducting an experiment and making a report on the obtained experimental data in the form (tables, diagrams, graphs); analyze the results of the experiment.  <i>Be competent:</i> in the organization of chemical production for the production of organic substances  <b>//ChemA 2212 Chemical analysis</b>  <i>To know:</i> theory and practice of chemical analysis of substances, raw materials or finished products.  <i>Be able to:</i> conduct various experiments, control the quality of raw materials, semi-finished products, and finished products, and use analytical methods to analyze new products.  <i>Have skills:</i> knowledge of calculation methods in various types of analysis, decoding of device data, compliance with the safety regulations when working with devices and equipment, and accuracy in handling chemical reagents and dishes.  <i>Be competent:</i> in the selection of a chemical object for the production of organic substances.</p>
	PhCChem 2213 Physical and colloidal chemistry	BD/CCh	Exam	3	5	<p><b>PhCChem 2213 Physical and colloidal chemistry</b>  <i>To know:</i> chemical thermodynamics; surface phenomena; adsorption; Gibbs, Langmuir, and Freundlich adsorption; probability of spontaneous direction of the process; rate of flow; states of equilibrium in the system; possible thermal and phase processes; Classification of dispersed systems and colloidal solutions.  <i>Be able to:</i> distinguish between the methods and methods of chemical analysis of substances used; understand the main parameters of the chemical process under study and dispersed colloidal systems in the environment, including biological systems.  <i>Have skills:</i> when choosing laboratory equipment, basic instruments and methods of physical and chemical measurements that have been used in practice; in conducting an experiment; in making a report on the experimental data obtained (tables, diagrams, graphs); in analyzing the results of the experiment (conclusions, generalizations, conclusions).  <i>Be competent:</i> in the organization of the production process, understanding the physico-chemical processes</p>



	SCM 3215 Standardization, certification, metrology	BD/CCh	Exam	5	5	<p><b>SCM 3215 Standardization, certification, metrology</b>  <i>To know:</i> regulatory documents, materials for the operation of equipment, technical requirements for raw materials and products, methods of metrological support for measurements, standards in the field of chemical engineering.  <i>Be able to:</i> comply with the documentation requirements in the conditions of the technological process, ensure the operation of the equipment, monitor the update of regulatory and technical documentation on the indicators of raw materials and manufactured products, and use the state standardization system in practice.  <i>Have skills:</i> in the procedure of measurement and certification; the use of modern measurement technologies, which are a sequence of actions aimed at obtaining measurement information of the required quality.  <i>Be competent:</i> in the application of the provisions and requirements of legislative and regulatory documents, in the development of procedures and methods of control of measuring instruments</p> <p><b>//SC 3215 Standards and controls</b>  <i>To know:</i> technological bases of the information and management system of product quality management, various types of standards, metrological methods. .  <i>Be able to:</i> use the basic concepts and terms, the main methods of quantitative assessment of the quality of chemical raw materials and products of their processing, the main standards and regulations in the field of chemical technology of organic substances and apply them in practice.  <i>Have skills:</i> in studying the basics of technical measurements and systems for reproducing units of quantities, working with the State System for Ensuring the Uniformity of Measurements, bodies and services for metrology, international and regional organizations for metrology, in metrological activities in the field of ensuring the uniformity of measurements, working with standards and regulatory documentation in the field of chemical technology of organic substances.  <i>Be competent:</i> in the application of the provisions and requirements of legislative and regulatory documents, in the development of procedures and methods of control of measuring instruments</p>
	//SC 3215 Standards and controls					
	BPACChemP 4216 Basic processes and apparatuses of chemical production	BD/CCh	Exam, Course project	8	8	<p><b>BPACChemP 4216 Basic processes and apparatuses of chemical production</b>  <i>To know:</i> chemical production processes, modern devices and equipment, methods of physical and mathematical modeling; fundamentals of the theory of the phenomena of the transfer of the amount of motion, mass and energy.  <i>Be able to:</i> apply the basics of physical modeling of absorption, adsorption, and rectification processes, and identify common patterns in calculations for typical processes and apparatuses.  <i>Have skills:</i> in the selection of standard equipment for carrying out processes under specified conditions. Calculation and design of installations for chemical production processes.</p>

	ChemTPHP4216 Chemical technology of pharmaceutical production					<p><b>Be competent:</b> in the production of a chemical technology product of organic substances</p> <p><b>ChemTPHP4216 Chemical technology of pharmaceutical production</b></p> <p><b>To know:</b> classification of medicines; principles of technological processes for the development of medicines, the establishment of authenticity and quality assessment.</p> <p><b>Be able to:</b> apply general methods for assessing the quality of medicines; factors, chemical methods that are the basis for the qualitative analysis of medicines; when working with laboratory equipment, basic devices and methods of physical and chemical measurements that have been used in practice.</p> <p><b>Have skills:</b> in the theoretical foundations of modern physical methods for studying the characteristics of various factors that affect the body. Principles of operation of the main physical devices.</p> <p><b>Be competent:</b> in the production of a chemical technology product of organic substances</p>
ThFOS 08 Module Theoretical foundations of organic substances	ChemNC 2217 Chemistry of natural compounds	BD/CCh	Exam, Test tasks	4 3	6	<p><b>ChemNC 2217 Chemistry of natural compounds</b></p> <p><b>To know:</b> modern trends in the chemistry of natural compounds obtained from plant raw materials, which are organic compounds, classification by structure and methods of use as medicines; basic principles of targeted search and development of medicines, as well as the choice of methods of physical and chemical analysis of plant raw materials.</p> <p><b>Be able to:</b> determine the type of natural compounds, the qualitative composition and the quantitative content of various medicinal substances.</p> <p><b>Have skills:</b> handling of chemical reagents, devices and equipment; in the choice of methods and means for determining the type of natural compounds.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances</p> <p><b>BChem 2217 Biochemistry</b></p> <p><b>To know:</b> the role of biological chemistry; on the chemical structure, properties, and biological functions of proteins, carbohydrates, lipids, and other biologically active compounds in living organisms.</p> <p><b>Be able to:</b> work with modern devices when conducting biochemical analyses; use maps of metabolism, special reference material.</p> <p><b>Have skills:</b> determination of products of intermediate metabolism of carbohydrates, lipids and proteins in human biological fluids; determination of the activity of enzymes in human biological fluids.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances</p>
	CMChem 3218 Computer methods in chemistry	BD/CCh	Test tasks	6	5	<p><b>CMChem 3218 Computer methods in chemistry</b></p> <p><b>To know:</b> about applied computer methods in chemistry; algorithm, programs: ChemOffice 7.0, ChemDraw Ultra 7.0, MOPAC, HyperChem 8.0.5, basic physical and chemical properties of inorganic and organic molecules.</p> <p><b>Be able to:</b> determine the reaction rate; programs for performing quantum chemical calculations; algorithm of programs in computer chemistry; postulates of quantum mechanics; theory of chemical coupling, methods for accounting for electronic correlation of semi-empirical methods.</p> <p><b>Have skills:</b> in the use of the studied processes for calculating the main parameters of the</p>

						<p>ongoing chemical process, selecting the optimal process parameters; modeling molecular structures using the ChemOffice software package; constructing and modeling molecular structures using the HyperChem software package; quantum chemical calculations in the MOPAC program.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p> <p><b>// MMChemP 3218 Mathematical modeling of chemical processes</b></p> <p><b>To know:</b> methods of mathematical modeling of chemical processes used to obtain the target products of the synthesis of substances.</p> <p><b>Be able to:</b> use the studied processes to calculate the main parameters of the ongoing chemical process, to select the optimal process parameters.</p> <p><b>Have skills:</b> mathematical modeling, methods that study the structure of matter; calculation of optimal parameters, conditions for the reactions of technological processes.</p> <p><b>Be competent:</b> in the development of design documentation for the design of technical facilities</p>
	// MMChemP 3218 Mathematical modeling of chemical processes					
	ChemPhOGC 4219 Chemistry and Physics of Oil, Gas and coal	BD/CCh	Exam	7	5	<p><b>ChemPhOGC 4219 Chemistry and Physics of Oil, Gas and coal</b></p> <p><b>To know:</b> chemical composition, physical and chemical properties of oil, coal, gas, and petroleum products. Elementary composition of oil and its physical properties.</p> <p><b>Be able to:</b> apply the acquired knowledge to solve the tasks set in this discipline: oil production and transportation; classification and properties, apply the obtained theoretical knowledge in practice.</p> <p><b>Have skills:</b> knowledge of the fundamental approach to the study of the properties of oil, coal and gas.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances.</p> <p><b>// ChemTMS 4219 Chemistry and Technology of Medicinal substances</b></p> <p><b>To know:</b> theoretical foundations of devices in the selection of modern technological research methods, organic chemistry; characteristics of factors that affect the production process; the principle of operation of the main devices and devices for the study of medicinal substances.</p> <p><b>Be able to:</b> apply general methods for evaluating the quality of medicines; factors, chemical methods that are the basis for the qualitative analysis of medicines.</p> <p><b>Have skills:</b> in the use of chemical and physical analysis methods to determine the authenticity of medicinal plant raw materials.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances.</p>
	// ChemTMS 4219 Chemistry and Technology of Medicinal substances					
	ChemTS 3220 Chemical and technological systems	BD/CCh	Exam	6	5	<p><b>ChemTS 3220 Chemical and technological systems</b></p> <p><b>To know:</b> chemical production, structure; criteria for evaluating efficiency, general patterns of chemical processes. General chemical technology of organic products based on gaseous, liquid and solid hydrocarbons and their differences, introduction to the basics of the theory of the phenomena of the transfer of the amount of motion, mass and energy; criteria for evaluating the quality of products and the efficiency of chemical production.</p>

	FPhChem 3220 Fundamentals of pharmaceutical chemistry					<p><b>Be able to:</b> synthesize chemical compounds, perform qualitative and quantitative analysis of a chemical compound using chemical and physico-chemical analysis methods.</p> <p><b>Have skills:</b> formation of the basics of technological thinking, the choice of standard equipment for carrying out processes under given conditions, calculate the design of the installation for carrying out a given process.</p> <p><b>Be competent:</b> in the organization of the production process, understanding the physico-chemical processes</p> <p><b>FPhChem 3220 Fundamentals of pharmaceutical chemistry</b></p> <p><b>To know:</b> general methods for assessing the quality of medicines; chemical methods that are the basis for the qualitative analysis of medicines.</p> <p><b>Be able to:</b> describe the physical and chemical properties of medicines; determine the choice of methods of analysis, dosage form, stability and storage conditions; recognize the modern nomenclature and classification of medicines; list the sources and methods of obtaining medicines that form the quality requirements (the content of initial, intermediate, related products and other quality indicators).</p> <p><b>Have skills:</b> the use of macroscopic analysis to determine the authenticity of medicinal plant raw materials.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p>
<b>PD-Profile disciplines</b>						
<b>UC-University component</b>						
FOST 09 Module Fundamentals of Organic Substances Technology	ChemTOS 3301 Chemical technology of organic substances	PD/UC	Exam	5	5	<p><b>ChemTOS 3301 Chemical technology of organic substances</b></p> <p><b>To know:</b> principles of classification and nomenclature, structure and properties of the main classes of organic compounds; basic methods of synthesis of organic compounds; the main stages of qualitative and quantitative chemical analysis; electrochemical, spectral methods of separation and concentration of substances; methods of metrological processing of analysis results.</p> <p><b>Be able to:</b> perform basic chemical operations, use basic chemical laws, thermodynamic reference data to solve professional problems; synthesize organic compounds, conduct qualitative and quantitative analysis of organic compounds using chemical and physico-chemical analysis methods.</p> <p><b>Have skills:</b> in experimental methods of synthesis, purification, determination of physical and chemical properties and determination of the structure of organic compounds; methods of chemical analysis and metrological evaluation of its results.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances</p>
	PP2 3302 Production practice 2	PD/UC	Exam, report	6	5	<p><b>PP2 3302 Production practice 2</b></p> <p><b>To know:</b> in full, the chemical properties of the main classes of organic substances and methods of their synthesis; methods for isolating the main and by-products of organic reactions; the main types and designs of reactors for conducting organic reactions.</p> <p><b>Be able to:</b> collect data that characterize production and technical, environmental, ergonomic, socio-economic and other indicators of production, focus on advanced methods of performing production processes and technologies.</p>

						<p><b>Have skills:</b> methods for determining the structure of organic compounds by physico-chemical methods and their quantitative analysis; methods for conducting kinetic studies and constructing kinetic models of organic reactions based on experimental data.</p> <p><b>Be competent:</b> in the technology and general principles of the implementation of common chemical processes for processing natural energy carriers and obtaining carbon materials.</p>
TS10 Technology and Security module	OHS 3303 Occupational health and safety	PD/UC	Test tasks	5	5	<p><b>OHS 3303 Occupational health and safety</b></p> <p><b>To know:</b> the main provisions of the Constitution of the Republic of Kazakhstan, legislative and regulatory acts in the field of labor protection and safety, the system of labor safety standards, regulatory and technical documents on occupational health and safety, industrial sanitation, fire safety, the rights and obligations of the employee and employer in the field of labor protection, the organization of state supervision and public control over labor protection, the system of management of labor protection in the organization; legislative acts of the Republic of Kazakhstan in the field of emergency situations; theoretical foundations of life safety in the "man-environment" system; fundamentals of human interaction with the environment and rational conditions of activity; means and methods for improving 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 for monitoring dangerous and extremely dangerous situations.</p> <p><b>Be able to:</b> analyze, interpret and correctly apply the 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; use means of collective and individual protection against the effects of harmful and dangerous industrial 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 environment, to conduct continuous monitoring and monitoring of the environment, to develop, plan and implement measures to improve the safety of life and eliminate the negative consequences of exposure to dangerous and harmful factors.</p> <p><b>Have skills:</b> work with legal acts included in the legislation on labor protection; effective use of knowledge and skills in the field of labor protection and safety; comprehensive solution of 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 participation in rescue operations; use of means of individual protection, protection of the person and the environment from negative impacts, planning and participation in carrying out rescue operations, use of means of individual and collective protection, rendering first aid to victims, creation of a normal (comfortable) state of the human environment.</p> <p><b>Be competent:</b> in the application of the provisions and requirements of legislative and regulatory documents, in the development of procedures and methods of control of measuring instruments</p>
	ChemTSF 4304 Chemical technology of	PD/UC	Course work	7	5	<p><b>ChemTSF 4304 Chemical technology of solid fuels</b></p> <p><b>To know:</b> the state and prospects of the raw material base of the coke and chemical industry, the requirements for production efficiency, the quality of raw materials and products; the principles</p>

	solid fuels					<p>of constructing technological schemes and designing technological processes.</p> <p><b>Be able to:</b> creatively use general scientific and engineering disciplines to manage the processes of chemical processing of solid fuels; develop a technology for processing solid fuels for the production of various types of fuels; understand and explain the complex phenomena encountered in the diverse processes of processing solid fuels, and make optimal decisions on this basis.</p> <p><b>Have skills:</b> compliance with safety regulations; mastering methods of chemical and instrumental analysis of coal, peat, shale and solid, liquid, and gaseous products and their quality control, handling laboratory utensils and equipment, independent work on educational and special literature; planning and conducting experiments with the interpretation of results, solving chemical problems of a computational and theoretical nature.</p> <p><b>Be competent:</b> in the selection of a chemical object for the production of organic substances</p>
	PP 4305 Pre-graduate practice	PD/UC	Exam, report	8	5	<p><b>To know:</b> theory, apply it in practice, make rational use of the possibilities of modern technology, study and implement modern technologies.</p> <p><b>Be able to:</b> collect and analyze materials for the completion of the final qualification work.</p> <p><b>Have skills:</b> practical training for independent work as a process engineer, collecting the necessary materials on the topic of diploma design, consolidating the acquired theoretical knowledge.</p> <p><b>Be competent:</b> in mastering the practical conditions of the principles of organization and management of production, analysis of economic indicators of production, increasing the competitiveness of products.</p>
<b>CCh - Component of choice</b>						
ChemT 11 Chemical Technology Module	TFFOS 4306 Theoretical foundations of fine organic synthesis	PD/CCh	Exam	7	8	<p><b>TFFOS 4306 Theoretical foundations of fine organic synthesis</b></p> <p><b>To know:</b> organic synthesis of limiting and unsaturated polymers, the basic principles and patterns of chemical production processes, the history of the development of industrial organic synthesis.</p> <p><b>Be able to:</b> assist in the study and analysis of the current state and trends in the development of the fine organic synthesis industry, which provides health care, agriculture, machinery and household chemical products.</p> <p><b>Have skills:</b> work on devices designed to assess the quality of organic materials, to determine the properties of substances, to identify the relationship between the structure and properties of compounds.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p>
	//ChemR 4306 Chemical reactors					<p><b>//ChemR 4306 Chemical reactors</b></p> <p><b>To know:</b> types of reactors, reactors in the technology of basic organic and petrochemical synthesis; the main indicators of the processes occurring in the reactor: the conversion of reagents, the yield of products, the selectivity of the chemical process, based on the properties of organic compounds, as well as their main methods of production, purification and identification.</p> <p><b>Be able to:</b> use the theory of hydrostatic and hydrodynamic processes; calculate the material and thermal balances of the main production facilities and individual devices; make a synthesis plan, perform calculations for the synthesis, identify the synthesis products; observe safety</p>

						<p>regulations.</p> <p><b>Have skills:</b> planning and conducting an experiment, interpreting its results, solving chemical problems of a computational and theoretical nature, mastering the basics of the theory of chemical and technological processes and the design of modern chemical reactors; principles of calculating chemical and technological processes; handling laboratory utensils and equipment, independent work on educational and special literature.</p> <p><b>Be competent:</b> in the production of a chemical technology product of organic substances</p>
	PPPT 4307 Polymer production and processing technology  //ChemHMC 4307 Chemistry of high-molecular compounds	PD/CCh	Test tasks	7	6	<p><b>PPPT 4307 Polymer production and processing technology</b></p> <p><b>To know:</b> types of polymers, organic synthesis of natural, artificial, synthetic monomers and polymers, their representatives, physical and chemical bases, mechanism and kinetics, and general technology of polymer production processes; interrelation of methods of synthesis and structure of polymers; basic methods of chemical modification of polymers; fundamentals of physics of amorphous and crystalline polymer bodies; fundamentals of the theory of concentrated and dilute polymer solutions.</p> <p><b>Be able to:</b> perform basic chemical operations of synthesis, isolation of polymers, as well as their chemical modification; analyze the physico-chemical laws, mechanism and kinetics of the processes of polymer production and their chemical modification; determine the kinetic and thermodynamic characteristics of chemical reactions of polymer production; summarize and process experimental information in the form of laboratory reports.</p> <p><b>Have skills:</b> works with modern devices for physical and chemical studies of various polymer materials; methods of processing and analyzing the results of experiments in the technology of processing polymer materials.</p> <p><b>Be competent:</b> in the production of a chemical technology product of organic substances</p> <p><b>//ChemHMC 4307 Chemistry of high-molecular compounds</b></p> <p><b>To know:</b> chemistry of polymers and polymer composite materials; physics of polymers and polymer composite materials; methods of research of polymers and polymer composite materials.</p> <p><b>Be able to:</b> to perceive, generalize and analyze information; to apply the knowledge gained in the field of chemistry and physics of polymers in practice; to apply theoretical knowledge of the main methods in the performance of work; to use the knowledge gained in the course of research work.</p> <p><b>Have skills:</b> works with modern devices for physical and chemical studies of various polymer materials; methods of processing and analyzing the results of experiments in the technology of processing polymer materials.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p>
TAOS 12 Module Technology and analysis of organic substances	ChemTOPPP 3308 Chemical technology of oil and petroleum products processing	PD/CCh	Course work	6	5	<p><b>ChemTOPPP 3308 Chemical technology of oil and petroleum products processing</b></p> <p><b>To know:</b> classification and nomenclature of monomers, oligomers and polymers; features of their chemical structure; synthetic organic, organoelement, inorganic and natural polymers.</p> <p><b>Be able to:</b> determine the quality control, knowing the chemical properties of oil products, select the technological parameters and production mode, optimize the production process, make chemical and technological flowcharts of production.</p> <p><b>Have skills:</b> compliance with safety regulations; handling of laboratory utensils and equipment, independent work on educational and special literature; planning and conducting an experiment,</p>

	<p>////SBAS 3308 Synthesis of biologically active substances</p>					<p>interpreting its results, solving chemical problems of a computational and theoretical nature.  <b>Be competent:</b> in the selection of a chemical object for the production of organic substances.  <b>////SBAS 3308 Synthesis of biologically active substances</b>  <b>To know:</b> basic concepts on the structure, properties and functions of organic compounds and the synthesis of biologically active compounds.  <b>Be able to:</b> conduct theoretical research, use reference and monographic literature in the field of chemistry of biological substances; draw up a scheme for multi-stage synthesis of a given product and synthesize it according to known methods; apply an interdisciplinary approach to analysis and problem solving in independently choosing technical means, a rational scheme for the production of a given product.  <b>Have skills:</b> to be able to conduct experimental research and analyze the results obtained; to know the rules of safe work; to make reports and reports, to participate in discussions; to use methods of environmental support of production and engineering environmental protection; to evaluate the prospects of the process (technology) from the point of view of environmental safety and efficiency.  <b>Be competent:</b> in the production of a chemical technology product of organic substances.</p>
	<p>TMPSTMG 4309 Technological methods for the preparation, storage and transportation of methane gas</p>	<p>PD/CCh</p>	<p>Course work</p>	<p>8</p>	<p>5</p>	<p><b>TMPSTMG 4309 Technological methods for the preparation, storage and transportation of methane gas</b>  <b>To know:</b> classification, composition, properties of natural and artificial gases, theoretical foundations of gas movement through pipes, conditions of storage and preparation of gases for transport. basic types and principles of classification of oil and gases; component composition of oil and other hydrocarbon systems of natural and man-made origin; physical and chemical properties of the main classes of hydrocarbons.  <b>Be able to:</b> use the principles of classification of oil and gas systems; apply knowledge about the composition and properties of oil and gas in the relevant calculations when conducting experiments, observe safety procedures to process, interpret the results and draw conclusions; using standard software tools.  <b>Have skills:</b> methods of research of oil and oil products and methods of separation, taking into account the peculiarities of oil and natural gases of the fields of the Republic of Kazakhstan; the causes of complications (hydrate formation, etc.) arising during the production, preparation, transport, storage of oil and gas; the use of physical and mathematical apparatus for solving computational and analytical problems; knowing their composition and physical and chemical properties.  <b>Be competent:</b> in the production of a chemical technology product of organic substances.  <b>// TMP 4309 Technology of medicinal polymers</b>  <b>To know:</b> directions of organic synthesis of monomers and polymers, their representatives,</p>

	// TMP 4309 Technology of medicinal polymers					<p>physical and chemical bases of polymer processing, basic and specific technological schemes for the production of medicinal polymer materials in industry and in laboratories, areas of their application.</p> <p><b>Be able to:</b> to identify the relationship between the structure and properties of polymers, to use them in industrial methods for the production of medicinal polymers, to work on devices designed to assess the quality of polymer materials, to determine the properties of polymers.</p> <p><b>Have skills:</b> in the pharmaceutical analysis of medicinal substances and dosage forms; orientation in a wide range of modern polymer materials; selection of methods for the production and processing of medicinal polymers.</p> <p><b>Be competent:</b> in the production of a chemical technology product of organic substances.</p>
	APP 3310 Analysis of petroleum products  // GM 3310 General Microbiology	PD/CCh	Exam	5	5	<p><b>APP 3310 Analysis of petroleum products</b></p> <p><b>To know:</b> analysis of petroleum products, physical and chemical properties and patterns of chemical processes in oil and petroleum products, equipment for the study of processes occurring in oil and petroleum products.</p> <p><b>Be able to:</b> perform quality control, chemical properties of oil products, select technological parameters and production mode, optimize the production process, make chemical and technological flowcharts of production.</p> <p><b>Have skills:</b> compliance with safety regulations; handling of laboratory utensils and equipment, independent work on educational and special literature; planning and conducting an experiment, interpreting its results, solving chemical problems of a computational and theoretical nature.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p> <p><b>// GM 3310 General Microbiology</b></p> <p><b>To know:</b> the main 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; the basics of cultivation of microorganisms; technological processes for obtaining biomass and products of fine microbiological synthesis; requirements for raw materials and the final product.</p> <p><b>Be able to:</b> 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; perform sanitary and microbiological control in laboratories and in production; work with cultures of microorganisms; determine the purity and activity of cultures and preparations.</p> <p><b>Have skills:</b> compliance with safety regulations, handling of laboratory utensils and equipment, independent work on educational and special literature; planning and conducting the experiment, interpreting its results, solving biotechnological problems of a computational and theoretical nature; taking the test material and delivering it to the bacteriological laboratory.</p> <p><b>Be competent:</b> in conducting chemical experiments to obtain organic substances</p>
	FEED 2311	PD/CCh	Exam	4	6	<b>FEED 2311 Fundamentals of Enterprise Equipment Design</b>

	Fundamentals of Enterprise Equipment Design					<p><b>To know:</b> methods of control of organic synthesis products, regulatory documents on legal issues in the field of quality, theoretical foundations of methods of product quality control.</p> <p><b>Be able to:</b> use a variety of methods for controlling organic synthesis products, in accordance with state standards.</p> <p><b>Have skills:</b> selection of methods for the control of organic synthesis products, work with regulatory documents on legal issues in the field of quality.</p> <p><b>Be competent:</b> in the production of a chemical technology product of organic substances.////<b>FB 2311 Fundamentals of biotechnology</b></p> <p><b>To know:</b> principles of selection of producers of biologically active compounds; principles of cellular and genetic engineering; fundamentals of solving theoretical and applied problems of biotechnology; prospects for the development of biotechnology.</p> <p><b>Be able to:</b> prepare culture media for the cultivation of microorganisms, plant and animal cells and tissues, sterilize and isolate the source material.</p> <p><b>Have skills:</b> work with microscopic equipment (microscopes, micromanipulators, microinjectors).</p> <p><b>Be competent:</b> in the production of a chemical technology product of organic substances.</p>
<b>FC-Final certification</b>						
FC 13 Module Final certification	WDThPPCE (P) 4501 Writing and defending a thesis (project) or preparing and passing a comprehensive exam	<b>FC</b>	Defense of a thesis (project) or passing a comprehensive exam	8	12	<p><b>To know:</b> trends in the development of chemical technology, the main scientific and technical problems and prospects for development in the field of chemical technology for the production and processing of polymers, oil, gas, coal processing and their relationship with related industries; principles for constructing technological schemes for the production of organic substances processing and the choice of technological equipment for oil and petrochemical enterprises, principles for creating waste-free, environmentally friendly technologies; requirements for completing, writing a thesis (project), drawing up an explanatory note and graphic part; key and practically significant provisions in the disciplines of general professional and special training, the procedure for conducting the exam.</p> <p><b>Be able to:</b> collect and analyze materials for writing a final qualification paper, synthesize organic compounds, use well-known analysis methods to confirm the identification of the resulting compounds, perform the necessary calculations of technological equipment and the output of the target product; use knowledge on theoretical issues in preparation for the comprehensive exam.</p> <p><b>Have skills:</b> knowledge of the fundamentals of the theory of fundamental sections of chemistry and technology (in the chemical technology of biologically active substances, processing of plant raw materials and oil, chemistry of polymers, surfactants, film-forming substances); in the application of the basic laws of chemistry when discussing the results of the experiment; conducting a chemical experiment, the main methods of obtaining and studying substances and chemical reactions; in the methods of recording and processing the results of the experiment; knowledge of methods of safe handling of various chemicals.</p> <p><b>Be competent:</b> in planning and conducting chemical experiments, processing their results and error estimation, mathematical modeling of chemical processes and phenomena, principles of constructing technological schemes for the production of processing of organic substances and</p>

						<p>the selection of technological equipment of oil-producing and petrochemical enterprises, principles of creating waste-free, environmentally friendly technologies; using knowledge on the properties of chemical elements, compounds and materials based on them to solve professional tasks; studying scientific and technical information, domestic and foreign experience on the subject of research when writing a thesis project and passing a comprehensive exam on theoretical issues included in the specialty of CTOS.</p>
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#### 4. Summary table showing the amount of loans disbursed by modules of the educational program:

Course of study	Semester	Number of modules to be mastered	Number of subjects studied			Number of credits										Total in hours	Quantity	
			RC	UC	OC	Theoretical training	Educational practice	Educational practice	Psychological and pedagogical practice	Teaching practice	Production practice	Pre-graduate practice	Final report attestation	Total	Exam		Def. credit (CP, CP)	
1	1	5	5	2	-	30								30	900	5	2	
	2		3	3	1	30	5							30	900	6	1	
2	3	5	3	1	3	30								30	900	4	3	
	4		2	2	3	30					5			30	900	5	1	
3	5	7	-	3	2	30								30	900	5	-	
	6		-	3	3	30					5			30	900	4	1	
4	7	4	-	2	3	30								30	900	3	1	
	8		1	1	2	18						5	12	30	900	2	2	
Total		13	13	17	17	228	5					10	5	12	240	7200	34	6

1 DEVELOPED BY:

Drafter:

Takibaeva A. T. associate professor of the Department of Chemistry and Chemical Technology

Alimzhanova A. Zh. assistant of the Department of Chemistry and Chemical Technology

2 DISCUSSED:

2.1 at the meeting of the Department of Chemistry and Chemical Technology

Protocol №     of «\_\_ » \_\_\_\_\_ 2021 .

Head of the department \_\_\_\_\_ Takibaeva A. T.

2.2 at the meeting of the Quality Assurance Committee of the Faculty of Innovative Technologies

Protocol №     of «    » \_\_\_\_\_ 2021.

Chairman \_\_\_\_\_ Savchenko N. K.