NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

6B05 - Natural Sciences, Mathematics and Statistics
(Code and classifcation of the feld of education)

6B053 - Physical and chemical sciences
(Code and classifcation of the direction of training)

0530
(Code in the International Standard Classifcation of Education)

B053 - Chemistry
(Code and classifcation of the educational program group)

6B05301 - Chemistry
(Code and name of the educational program)

Bachelor
(Level of preparation)

Semey

Educational program

6B05 - Natural Sciences, Mathematics and Statistics
(Code and classification of the field of education)

6B053 - Physical and chemical sciences
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bachelor
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Semey 2023

PREFACE

Developed

The educational program 6B05301 - Chemistry in the direction of preparation 6B053 - Physical and chemical sciences on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymkhan Gulnur	Dean of Engineering-technologycal faculty, PhD	
Educational program manager	Nurgaliyev Nurzhan	Senior lecturer of the Department Chemical technology and ecology, PhD	
Member of the AC	Sabitova Alfira	Head of the department Chemical technology and ecology, PhD	
Member of the AC	Kassymova Zhanar	Associate professor of the department Chemical technology and ecology, PhD	
Member of the AC	Nurgaliyev Nurzhan	Senior lecturer of the department Chemical technology and ecology, PhD	
Member of the AC	Mostovaya Elena	Head of test laboratory, Semey Cement factory	
Member of the AC	Kaliaskarova Bibigul	Chemical Engineer, Department of Processing and Quality Control of Radiopharmaceuticals, Center for Nuclear Medicine and Oncology	
Member of the AC	Zhazitov Anuar	Student of the XM-001 group, EP 6B05301-Chemistry	
Member of the AC	Orazalinova Akmaral	Student of the XM-101 group, EP 6B05301-Chemistry	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Dinzhumanova Raushan	PhD, Associate Professor of the Department of Biochemistry and Chemical Disciplines named after Doctor of Medical Sciences, Professor S.O. Tapbergenov, Semey Medical University, Republic of Kazakhstan	

Reviewed

at the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4/6 10.04.2023.
Chairman of the Commission on Quality Assurance Abdilova G.B.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

Approved

at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

Content

1.Introduction

1.1.General data

The educational program « 6B05301 Химия» is developed taking into account the needs of the regional labor market, the requirements of the normative documents of the Ministry of Education and Science of the Republic of Kazakhstan and is a system of documents for organizing the educational process.

The uniqueness of the educational program lies in the fact that it includes a large portfolio of elective courses, developed with a strong teaching staff, and a good laboratory base for its implementation.

The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of bachelors is the mastering by students of at least 205 credits of theoretical training, as well as at least 27 credits of practical training, 8 credits of final certification.

A total of 240 credits.

1.3.Typical study duration: 4 years

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Providing vocational training and personal development of a graduate as a competitive specialist in the field of chemistry, possessing good educational, methodological and research training
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B05 - Natural Sciences, Mathematics and Statistics
Code and classification of the direction of training	6B053 - Physical and chemical sciences
Code in the International Standard Classification of Education	0530
Code and classification of the educational program group	B053 - Chemistry
Code and name of the educational program	6B05301 - Chemistry
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Science in the educational program
Name of the profession / list of positions of a specialist	Chemist; chemical engineer; chemical technologist; laboratory chemist (in laboratories of universities, research institutes of chemical, environmental, etc. profiles; chemical industry enterprises);analyst pharmacist; environmental chemist; secondary teacher general education schools, vocational education institutions, etc. in accordance with qualification the requirements of the Qualification Handbook of Positions 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
OQF qualification level (industry qualification framework)	6
Area of professional activity	• the sphere of education, science and ecology; • branches of chemical, metallurgical, petrochemical, pharmaceutical industry; • production laboratories of analytical, environmental, customs, sanitary and epidemiological, certification services, research organizations (institutes, laboratories) of the chemical, environmental, metallurgical, pharmaceutical profile.
Object of professional activity	• chemical substances and materials; • chemical, physical, physicochemical and thermal processes; • methods and devices for determining the composition and properties of substances and materials; • methods and means for assessing the state of the environment.
Types of professional activity	• experimental research; • research; • production and technological; • organizational and managerial; • educational (pedagogical) • cultural and educational.
Graduate Model	EP 6B05301- "Chemistry" trains highly qualified

	specialists for education, research and production, with in-depth fundamental educational, methodological and research training

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31755 (3022962)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline «Foreign language» assumes the formation of students` intercultural and communicative competencies at B1 level. The discipline is aimed at mastering the knowledge, skills and abilities that allow using a foreign language in interpersonal communication and professional activity. All types of speech activity are taught, such as reading, writing, listening and production of texts of level complexity with a certain degree of grammatical and lexical correctness.

Purpose of studying of the discipline

Formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level (A2, pan-European competence) and the level of basic sufficiency (B1, pan-European competence). Depending on the level of training, the student at the time of completion of the course reaches the B1 level of the pan-European competence if the language level of the student at the start is higher than the A2 level of the pan-European competence.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Foreign language

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31757 (3022967)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at deepening the acquired knowledge of students in the framework of the school curriculum, as well as the use of language and speech means based on a full understanding of vocabulary and grammatical system of knowledge; the formation of socio-humanitarian worldview of students within the framework of the national idea of spiritual revival; free expression of mobile thought as a means of speech communication and in the process of communication; awareness of the national culture of the people, the ability to distinguish features of national cognition.

Purpose of studying of the discipline

Forms through phraseological units the recognition of national culture, its meaning as a linguistic unit related to spiritual culture; skills of identifying facts of national and cultural significance in the formation of Kazakh phraseology.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Kazakh language

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines

Discipline component	University component
SubjectID	31758 (3023039)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The integrated discipline includes the main issues and principles in the field of fundamentals of law and anti- corruption culture, economics, entrepreneurship and leadership, ecology and life safety. Features of the use of regulatory legal acts, the ability to use the business, ethical, social, economic, entrepreneurial and environmental standards of society. Specifics of environmental-legal, economic, entrepreneurial relations, leadership qualities and principles of combating corruption.

Purpose of studying of the discipline

It consists in studying the basic patterns of the functioning of living organisms, the biosphere as a whole and the mechanisms of their sustainable development under the conditions of anthropogenic impact and emergency situations; in understanding the concept of corruption, the legitimacy of the fight against it, the content of the state penal policy; in the formation of students` basic fundamental stable knowledge on the basics of economic theory, in instilling the skills and abilities of economic thinking; in introducing students to the theory and practice of entrepreneurship, to the basics of creating their own business; in the formation of theoretical knowledge and practical skills for the development and improvement of leadership qualities.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31756 (3022965)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; for teaching students practical mastery of the Russian language in various areas of communication and various situations, mastering the specifics of functional semantic types and genres of functional styles of speech, enriching the vocabulary with special vocabulary, forming and improving the skills of monologue and dialogic speech.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Russian language

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31698 (3022958)

Course	1
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, preparing students for participation in mass sports competitions; forms motivational and value attitudes towards physical culture and the need for systematic physical exercises and sports; gives basic knowledge about the use of physical culture and sports in the development of vital physical qualities.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Physical Culture

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31765 (3022966)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at expanding language literacy, free communication with the environment and mental and ideological skills of the student, understanding the role of language in the process of mastering world- class knowledge through the formation of a future specialist`s worldview based on national consciousness and cultural code, improving the knowledge of the state language by future specialists, increasing the scope of use of the Kazakh language by specialists.

Purpose of studying of the discipline
Ensuring high- quality mastery of the Kazakh language as a means of social, intercultural, professional communication through the formation of communicative competencies at all levels of language use.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites
Kazakh language

Postrequisites
Basic and profile disciplines of the EP

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31763 (3022963)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and

communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline

Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

Foreign language

Postrequisites

Basic and profile disciplines of the EP Chemical terminology in English

History of Kazakhstan

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31766 (3023035)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Qualification examination

Short description of discipline

The main stages of the history of Kazakhstan are studied with: nomadic statehood, Turkic civilization, the era of colonialism, the Soviet period, independence. The driving forces, trends, patterns of historical development are analyzed; problems: ethnogenesis of the Kazakh people, the formation of statehood, national liberation movements, demographic development. The skills of analyzing historical events and facts, working with historical literature are being formed.

Purpose of studying of the discipline

The purpose of the discipline is to provide objective knowledge about the main stages of the development of the history of Kazakhstan from ancient times to the present.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31767 (3023037)
Course	1
Term	2
Credits count	8
Lections	30hours
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	55hours
Independent work of the student	110hours
Total	240hours
Knowledge control form	Examination

Short description of discipline

The module of socio-political knowledge involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; generality of the methodology of learning, result-oriented; unified system representation of the typology of learning

outcomes as formed abilities.

Purpose of studying of the discipline

Formation of social and humanitarian worldview of students in the context of solving the problems of modernization of public consciousness, defined by the state program "Looking into the Future: Modernization of Public Consciousness".

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31764 (3022964)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; to teach the scientific style of speech as a language of specialty, the creation of secondary texts, the formation of skills for the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication, instilling the skills of speech etiquette, business rhetoric.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

Russian language

Postrequisites

Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31762 (3022959)
Course	1
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, the ability to exercise control and self-control in the process of classes, gaining knowledge on health promotion, hardening and increasing the body`s resistance to the effects of adverse factors of labor activity, mastering methods of selection of physical exercises and sports.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31770 (3022961)
Course	2
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; increasing the level of physical fitness and developing physical qualities; mastering the technique of sports; education of discipline, collectivism, comradely mutual assistance; education of mental stability, development and improvement of basic motor qualities - endurance, strength, speed, dexterity, flexibility.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites
Physical Culture

Postrequisites
Basic and profile disciplines of the EP

World of Abai

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31775 (3023028)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying historical facts, the philosophical and artistic foundations of the works of Abay Kunanbaev, Shakarim Kudaiberdiev, which form worldview and aesthetic values, the student`s ability to express his opinion, practical skills and perception of such human qualities as morality, honesty, artistic character. The genius of the writers of Kazakh literature and the role of M. Auezov in the study and popularization of Abai`s heritage, the significance of his works for history, literature and science are determined.

Purpose of studying of the discipline
Formation of the meaning of philosophical and ideological being, understanding of the problems raised in the works of Abai Kunanbayuly, Shakarim Kudaiberdiuly, Mukhtar Auezov and application of the acquired knowledge in the practice of everyday life.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Information and communication technology

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31778 (3023038)
Course	2
Term	2
Credits count	5

Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at mastering the conceptual foundations of the architecture of computer systems, operating systems and networks by students; formation of the ability to critically understand the role and signifcance of modern information and communication technologies in the era of digital globalization, new "digital" thinking, knowledge about the concepts of developing network and web applications, skills in using modern information and communication technologies in various felds of professional activity, scientifc and practical work, for self-educational and other purposes.

Purpose of studying of the discipline
Formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31777 (3022960)
Course	2
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; acquisition of versatile abilities and skills for the development of physical abilities, socio-cultural experience and socio-cultural values of physical culture and sports; development of communication skills, thinking, self-development, the formation of experience in the implementation of sports and recreational and training programs.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites
Physical Culture

Postrequisites
Basic and profile disciplines of the EP

Philosophy

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31786 (3022971)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at developing students` openness of consciousness, understanding their own national code and self-consciousness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, a holistic view of philosophy as a special form of understanding the world, mastering key worldview concepts, as well as the development and strengthening of the values of tolerance, intercultural dialogue and a culture of peace.

Purpose of studying of the discipline

Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Prerequisites

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites

Basic and profile disciplines of the EP

Module 2. Application of mathematical methods and physical phenomena and laws in practice

Mathematics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31760 (3023029)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The purpose of this course is to provide students with fundamental training in mathematics. The course is aimed at forming a sufficiently high culture of mathematical thinking among students and developing the ability to creatively approach problem solving. In addition to studying the fundamental foundations of higher mathematics (elements of analytical geometry, linear algebra, mathematical analysis, differential equations), the course assumes consideration of various applications of mathematics to solving production problems from the field of professional specialization.

Purpose of studying of the discipline

creation of the basis for the development of logical thinking and mathematical culture. Formation of basic knowledge and acquisition of basic skills of using mathematical apparatus for solving theoretical and applied problems, as well as the necessary level of mathematical training for mastering other applied disciplines studied within a specific profile; skills of working with special mathematical literature

Learning Outcomes

ON 2 Apply mathematical methods and physical phenomena and laws in practice

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Solving problems of chemistry and chemical technology by computer software

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31810 (3022972)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies computer programs MS Word, MS Power point, MS Excell, Microcal Origin, Chem Office, etc., used to solve problems in chemistry and chemical technology. Uses the capabilities of these programs for chemical calculations. Forms the skills of processing experimental data, calculating chemical reactions and technological processes, as well as modeling the chemical structures and properties of molecules using computer programs.

Purpose of studying of the discipline
To apply modern mathematical methods and physical phenomena and laws for mastering technological processes.
Learning Outcomes
ON 2 Apply mathematical methods and physical phenomena and laws in practice
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems
Prerequisites
General chemistry
Postrequisites
Basic and profile disciplines of the EP

Chemical Physics

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	31828 (3023033)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course studies the main areas of application, structure, properties of a solid body. Considers the essence and features of the nature of the forces of interaction of crystals, the structures of energy bands, the localization of the state of electrons in a crystal. He studies the theory of collisions, non-equilibrium chemical reactions. Forms the concept of active intermediates, free radicals and atoms. He studies chain reactions, flame structure and kinetics of chemical reactions in a flame, basics of cryochemistry and laser thermochemistry.
Purpose of studying of the discipline
The study of the laws of chemical physics that determine the direction of the flow of chemical processes, the physical and chemical values of the basic laws of thermodynamics, kinetics, the mechanism of chemical reactions, their role in determining the direction of chemical processes and describing the equilibrium in the system.
Learning Outcomes
ON 2 Apply mathematical methods and physical phenomena and laws in practice
ON5 Use knowledge of applied chemistry in professional activities
Prerequisites
Physical chemistry Physical methods of research
Postrequisites
Basic and profile disciplines of the EP

Module 3. Usage theoretical foundations of fundamental sections of chemistry in solving professional problems

Introduction to the profession

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31761 (3023031)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The course studies the modern state of the chemical sphere. Considers the main directions of development of chemical technology, the production of inorganic, organic, polymeric materials, with the practice of the future work of the graduate. Studies the development of chemical knowledge, the prospects for the development of chemistry and chemical technology. Reveals the patterns and trends in the development of this science in its entirety, including chemical technology, as well as the prospects for scientific and technological progress
Purpose of studying of the discipline
To stimulate interest in the chosen profession, the formation of a worldview among students that contributes to a conscious attitude to studies, as well as to modern ways of obtaining professional knowledge

Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

General chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31759 (3022973)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
This course studies the theoretical and practical foundations of general chemistry. Examines the basic concepts and laws of chemistry. He studies the structure of matter on the basis of quantum mechanical concepts of the structure of the atom and the chemical bond. Outlines general information about complex compounds. Forms an idea of the patterns of chemical processes. He studies the fundamentals of chemical kinetics, chemical thermodynamics, the doctrine of solutions and electrochemistry.
Purpose of studying of the discipline
- study of chemical formulas and equations, structures and properties of substances, their ability to interact with other substances.
Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP Inorganic chemistry

Inorganic chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31769 (3022977)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course studies the theoretical and practical foundations of inorganic chemistry. Considers the physical and chemical properties of elements and their compounds, based on modern views, theories about the structure of substances, the nature of the chemical bond. Introduces the distribution and forms of occurrence in nature of chemical elements, methods of production, use of synthesis products. Forms an idea about the sources of chemical pollution of the environment and the role of chemistry in solving environmental problems.
Purpose of studying of the discipline
Obtaining knowledge about the properties of chemical elements and their compounds based on the laws and theories of chemical science, the forms of finding compounds in nature, methods of obtaining and practical application
Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence
Prerequisites
General chemistry
Postrequisites
Basic and profile disciplines of the EP

Educational practice

Discipline cycle	Basic disciplines

Discipline component	University component
SubjectID	31768 (3022956)
Course	1
Term	2
Credits count	2
Study practics	30hours
Total	30hours
Knowledge control form	Total mark on practice

Short description of discipline
Educational practice is organized in the educational laboratories of the department. It is planned to carry out practical, educational, research, creative tasks corresponding to the nature of future professional activity. Theoretical knowledge and practical skills acquired in the first year disciplines are consolidated. The ability to work with educational literature, handle chemical glassware, reagents and laboratory equipment and draw up a final report is revealed.

Purpose of studying of the discipline
Purpose of studying discipline: acquire the skills of a chemical experiment, apply the methods of synthesis and purification of substances in practice

Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence

Prerequisites
School course General chemistry

Postrequisites
Basic and profile disciplines of the EP

Analytical chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31772 (3022978)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course studies the theoretical and practical foundations of analytical chemistry. Considers heterogeneous processes and precipitation reactions, acid- base balances, complex formation reactions, redox reactions. Introduces the methods of qualitative chemical analysis: fractional and systematic analysis. Forms an idea of analytical reactions, their types, sensitivity, selectivity and specificity.Teaches methods of identifying, masking, isolating, separating, and concentrating.

Purpose of studying of the discipline
Students gaining knowledge about the theoretical foundations of modern qualitative analysis

Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence

Prerequisites
General chemistry Inorganic chemistry

Postrequisites
Basic and profile disciplines of the EP

Organic chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31771 (3022974)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
The course studies the types of chemical bonds in the molecules of organic compounds, the classification of organic molecules. Considers the spatial structure of organic compounds. He studies hydrocarbons, their properties and applications, as well as mono- and polyfunctional compounds, halogen derivatives. Considers alcohols and ethers, carbonyl compounds, their polarity, properties. Studies carboxylic acids and their derivatives, nitrogen-containing compounds, heterofunctional compounds
and synthesis methods

Purpose of studying of the discipline
To study of the main provisions of the theory of the structure of organic substances, the main classes of organic compounds, the dependence of the properties of organic compounds on their structure, patterns and mechanisms of organic reactions

Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence

Prerequisites
General chemistry

Postrequisites
Basic and profile disciplines of the EP

Solving problems in general and inorganic chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31776 (3024004)
Course	2
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline teaches modern theories of structure, nomenclature and classifications of inorganic substances. Considers extended in-depth versions of the methodology for solving problems of solving problems in general and inorganic chemistry in general. He studies systematic quantitative patterns and theories of chemical phenomena. Teaches the ability to solve chemical problems of the Olympiad type. Forms the concept of scientific and theoretical knowledge in chemistry for solving theoretical and practical problems. Learns to solve problems using mathematical and systems of equations.

Purpose of studying of the discipline
The study of advanced in- depth versions of the methodology for solving problems of solving problems in general and inorganic chemistry, as well as systematic quantitative laws and theories of chemical phenomena

Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence

Prerequisites
General chemistry

Postrequisites
Basic and profile disciplines of the EP

Physical chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31773 (3022979)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course studies the laws of thermodynamics and the basics of chemical kinetics, necessary for calculating the energy characteristics, direction, and kinetic parameters of physical and chemical processes. Assesses the thermodynamic possibility and kinetic parameters of chemical and physico- chemical processes in homogeneous and heterogeneous systems. Determines the influence of various external factors on the physical and chemical process. Assumes the probability of a reaction proceeding according to its thermodynamic parameters.

Purpose of studying of the discipline

Be able to apply the laws of thermodynamics and kinetics, understand the fundamental foundations of modern physical research methods

Learning Outcomes

ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence

Prerequisites

General chemistry

Postrequisites

Basic and profile disciplines of the EP Physical methods of research

Colloidal chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31789 (3022980)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course studies the physicochemical properties of dispersed systems and the thermodynamics of surface phenomena. Outlines general information about adsorption at the interface. Explains electrokinetic phenomena in dispersed systems. He studies the main characteristics of lyophobic and lyophilic- dispersed systems. Considers issues of sedimentation and aggregation stability, rules for coagulation of sols by electrolytes. Forms an idea of microheterogeneous systems.

Purpose of studying of the discipline

To study the physical and chemical laws of processes and phenomena occurring at the phase boundary, as well as the properties of dispersed systems; see the areas of application of these laws, understand their fundamental possibilities in solving specific professional problems

Learning Outcomes

ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites

Physical chemistry

Postrequisites

Fundamentals of Biochemistry

Module 4. Mastering the methods of synthesis, modification and technology for the production of chemicals and materials

Mechanisms of organic reactions

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31784 (3023032)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This discipline studies the main types of mechanisms of organic reactions and features, as well as the patterns of their course. The nature of electronic effects, varieties and conditions for the formation of intermediates, as well as the typology of reaction mechanisms are considered. The main types, stages and specifics of chemical transformations in a number of aliphatic and aromatic compounds are highlighted - radical chain reactions, electrophilic and nucleophilic substitution, addition, elimination.

Purpose of studying of the discipline

Obtaining by students of modern ideas about the mechanisms of reactions, methods of their study, as well as the formation of the ability to draw their own conclusions about the mechanism of the reaction under study,

confidently navigate the flow of information relating to the dynamics of chemical processes.

Learning Outcomes

ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials

Prerequisites

Organic chemistry

Postrequisites

Basic and profile disciplines of the EP

Chemical functional derivatives of organic molecules

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31783 (3023017)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course examines the basic principles of modern IUPAC nomenclature, hydrocarbon derivatives, their properties and applications. He studies the types of chemical bonds in molecules and the spatial structure of organic compounds. Covers polarity, properties, acid-base catalysis, synthesis methods and applications of halogenated hydrocarbons, alcohols, ethers, carbonyl compounds, amines, nitro compounds, amino acids, carbohydrates, nucleic acids, proteins, lipids and alkaloids.

Purpose of studying of the discipline

To study of fundamental organic chemistry sections: theory of the structure of organic molecules, the electronic and steric effects of stereoisomerism of organic molecules, chemical properties, fundamental reaction mechanisms.

Learning Outcomes

ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites

Organic chemistry

Postrequisites

Basic and profile disciplines of the EP

Chemistry of organometallic compounds

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31801 (3022982)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline gives an idea of organic derivatives of elements. The classification, structure and structure, fundamentals of preparation, reactivity, chemical properties of organoelement compounds - organometallic magnesium, organometallic copper, organometallic aluminum, organophosphorus compounds are considered. Organic compounds of transition metals are studied. The general problems of the chemistry of organoelement compounds, as well as the possibilities of their functionalization, are described. The issues of catalytic, biological properties of organoelement compounds are revealed.

Purpose of studying of the discipline

To study of the electronic structure, properties, reaction mechanisms organometallic compounds

Learning Outcomes

ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites

Organic chemistry

Postrequisites

Basic and profile disciplines of the EP

Analysis of minerals

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31805 (3022986)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This discipline studies the prevalence of chemical elements in the earth`s crust, sampling methods, general characteristics and classification of mineral silicate raw materials. The characteristics of the composition of carbonate rocks, sulfur-containing mineral raw materials, analysis of minerals and ores of ferrous metals, manganese and its ores, cobalt and its ores are considered. The analysis of minerals and ores of non-ferrous metals, as well as rare elements is covered.

Purpose of studying of the discipline

Studying the discipline is to form students` knowledge about the main stages of work on the technological assessment of mineral raw materials,
research skills and abilities

Learning Outcomes

ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites

General chemistry

Postrequisites

Basic and profile disciplines of the EP

low-waste technology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31804 (3022985)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The problems of choosing energy carriers and raw materials with the maximum utilization factor in the process, the basic principles of creating non-waste industries and the requirements for them are studied. Are being considered issues of optimizing the production of the target product with variable characteristics of raw materials and energy carriers. The main issues are discussed territorial connection of enterprises on the example of the waste of one enterprise, which is a raw material for another enterprise.

Purpose of studying of the discipline

To understand the general patterns of organization of non-waste production of inorganic substances (inorganic acids, bases, salts, fertilizers, etc.) using chemical, petrochemical, mining and metallurgical waste.

Learning Outcomes

ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites

General chemistry

Postrequisites

Basic and profile disciplines of the EP

Fundamentals of technological processes in industry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31803 (3022984)

Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This discipline studies the most important technological concepts and definitions, patterns of movement of material and energy flows, economic, environmental requirements for a rational and low-waste production process. The importance of thermodynamic and kinetic laws for technology, technological methods, acceleration and deceleration of reactions is considered. are illuminated types and sources of energy, main types and resources of raw materials, enrichment of mineral raw materials, industrial and sanitary requirements for water.

Purpose of studying of the discipline
Teaching students the development and updating of new methods and techniques of analysis, the development of systems with chemical-technological processes.

Learning Outcomes
ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
General chemistry

Postrequisites
Basic and profile disciplines of the EP

Macromolecular Chemistry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31800 (3022981)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Studies the criteria for the separation of high-molecular compounds and low-molecular substances, the most important properties of polymers, molecular mass characteristics of macromolecules, of polymer synthesis, the stages and kinetics of polymerization and polycondensation processes are considered. The physical and phase states of polymers are highlighted, thermomechanical curves of amorphous polymers are described, of the polymer dissolution process, the properties of polymer solutions, as well as the types of chemical transformations of macromolecules are discussed

Purpose of studying of the discipline
To familiarization of students with the basics of polymer science, formation of knowledge about the chemistry, physics and physical chemistry of polymers and the most important areas of polymer application

Learning Outcomes
ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
Organic chemistry

Postrequisites
Basic and profile disciplines of the EP

Chemistry of Natural Compounds

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31802 (3022983)
Course	3
Term	2
Credits count	5
Lections	15hours

Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This discipline studies natural compounds of inorganic and organic, as well as plant and animal origin. The types, structure, chemical properties, significance, methods of isolation and biosynthesis of proteins, amino acids, alkaloids, pigments, flavonoids, phenolic compounds, enzymes, coenzymes, carbohydrates, vitamins are considered. The biological significance of natural compounds, ways of chemical modification, prospects for use in medicine, biotechnology, biology, pharmacy are described.

Purpose of studying of the discipline
To study of the chemical structure, chemical transformations, and biological functions of natural organic compounds

Learning Outcomes
ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
Organic chemistry

Postrequisites
Basic and profile disciplines of the EP

Fundamentals of Biochemistry

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	31813 (3023030)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course examines the biochemistry of chemical elements and their compounds. Studies the characterization and synthesis by chemical and biochemical methods of important biological molecules. Describes secondary metabolic structures, natural biologically active substances obtained from plant and animal raw materials (nucleotides and amino acids, peptides and proteins, nucleic acids, carbohydrates and their derivatives, lipids, vitamins, hormones, biological catalysts, as well as active bioregulatory substances)

Purpose of studying of the discipline
It is the study of the molecular basis of life, the composition, structure, properties of biological substances, and the reactions of these substances according to the activity of life.

Learning Outcomes
ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
Organic chemistry Colloidal chemistry

Postrequisites
Basic and profile disciplines of the EP

Module 5. Use of knowledge in applied and instrumental chemistry in professional activities

Chemical terminology in English

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31774 (3022987)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
This course of chemical terminology in English is aimed at training in the study of chemical terms in the main sections of chemistry and

chemical technology. Exploring important issues suffixes and prefixes for active word formation in scientific chemical texts. Forms an idea of bilingual oral and written translations of chemical terms. Learns the basic principles of translating texts in chemical science.

Purpose of studying of the discipline

To teach students professional communicative competence - the ability to actively use a foreign language in their field, in everyday speech, in everyday life.

Learning Outcomes

ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence

Prerequisites

Foreign language

Postrequisites

Basic and profile disciplines of the EP

Analytical chemistry of trace amounts

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31781 (3022990)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course deals with the problem of trace analysis. He studies the basic terms and concepts, the principles of physico-chemical methods for the analysis of trace amounts. Forms an idea about the analytical signal and control experience. Teaches you how to choose methods of determination and how to combine methods for determining ultra-low concentrations and ultra-low doses. It reveals the role of trace elements in scientific research, the role of the matrix in determining traces, the role of losses and pollution in determining low concentrations.

Purpose of studying of the discipline

Obtaining students ` knowledge about the principles and techniques of analyzing trace amounts of substances.

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry

Postrequisites

Basic and profile disciplines of the EP

Quantitative analysis in Inorganic Chemistry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31780 (3022989)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines the theoretical and practical foundations of quantitative analysis in inorganic chemistry. Considers the essence and features, areas of application of the main methods of quantitative analysis. He studies the metrological foundations of chemical analysis. Forms the concept of analysis errors and methods for their detection. Teaches the use and conduct of chemical analysis by gravimetric and titrimetric methods of inorganic substances for the control of various technological processes.

Purpose of studying of the discipline

Obtaining students ` knowledge of the theoretical foundations and methods of chemical quantitative analysis of inorganic substances

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry
Postrequisites
Basic and profile disciplines of the EP

Production practice I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31782 (3023011)
Course	2
Term	2
Credits count	5
Working practice	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline
Production practice 1 represents a practical part of educational programs for the training of highly qualified specialists and is carried out at various enterprises in the conditions of production. It is an exceptional part of educational practice, which takes place in the highest educational institution. The results of theoretical training are acquired and concretized, skills and abilities of practical work are acquired, competencies are formed on the assigned qualification or profession.

Purpose of studying of the discipline
To consolidate the acquired knowledge and obtain the first practical skills in the future specialty
Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems
Prerequisites
Basic and profile disciplines of the EP
Postrequisites
Production practice II

The chemical quantitative analysis

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31779 (3022988)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the theoretical and practical foundations of chemical quantitative analysis and its applications: gravimetric, titrimetric analysis. Forms an idea of the metrological foundations of chemical analysis and statistical processing of analysis results. Teaches gravimetric analysis by stripping and settling methods. Reveals the essence of titrimetric analysis by studying the methods and methods of acid-base, redox titration, complex formation and precipitation.
Purpose of studying of the discipline
Students gain knowledge about the methods of chemical quantitative analysis, their theoretical foundations, as well as acquire the skills of laboratory experiments and the ability to draw theoretical conclusions based on the observed phenomena.
Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems
Prerequisites
General chemistry Analytical chemistry
Postrequisites
Basic and profile disciplines of the EP

Heterocyclic compounds

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31788 (3022976)
Course	3

Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline forms an idea of the electronic and spatial structure, meaning, synthesis methods, chemical properties of monocyclic and condensed heterocycles. The conditions of aromaticity, nomenclature, structure, properties, methods of cyclization of five-membered and six-membered cycles with one and several heteroatoms are studied. The basics of organic synthesis of condensed heterocyclic compounds are considered. The questions of the biological significance of some compounds and the prospects of their use are revealed.

Purpose of studying of the discipline
To study of basic concepts and concepts of heterocycle chemistry

Learning Outcomes
ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
Organic chemistry Mechanisms of organic reactions

Postrequisites
Basic and profile disciplines of the EP

Multi-core fused and unfused connection

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31787 (3022975)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline develops a chemical understanding of multicore aromatic compounds with condensed and non-condensed nuclei. The issues of nomenclature, construction, chemical properties and methods of synthetic and industrial production are considered. The structure and properties of the aliphatic fragment, triphenylmethane, fuchsins, phthalimides and dyes based on them are studied. The properties and synthesis of naphthalene, anthracene, phenanthrene, anthraquinone dyes, carcinogenic hydrocarbons are described

Purpose of studying of the discipline
To study of the general regularities of the structure, nomenclature, methods of production, physical and chemical properties, industrial application of multi-core condensed and non-condensed compounds.

Learning Outcomes
ON4 Own the methods of synthesis, modification and technology for the production of chemicals and materials
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
Organic chemistry Mechanisms of organic reactions

Postrequisites
Petrochemistry

Optical analysis methods

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31795 (3022996)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours

Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the origin of atomic spectra. Teaches the methods of atomic emission and atomic absorption spectroscopy, their essence and scope. Forms an idea about the occurrence of molecular spectra and methods of molecular spectroscopy. Reveals the essence of photometry methods: photocolorimetry, spectrophotometry, nephelometry, turbidimetry. Considers the essence of the method for determining the concentration and their scope, advantages. Forms the concept of the method of luminescence spectroscopy and the definition of concentration, applicability and advantages of the method, as well as IR spectroscopy.

Purpose of studying of the discipline
Training in the theoretical foundations and practical application of optical analysis methods

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry Physical chemistry

Postrequisites
Basic and profile disciplines of the EP

Stereochemistry of organic compounds

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31796 (3023020)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course studies the basics of chirality, prochirality, configuration, conformation, as well as with auxiliary concepts and specific stereochemical terminology (chirality element, prochirality element, pseudochirality, enantiomers, diastereomers, epimers, racemic mixture, meso- form, top group relations. Considers the essence of asymmetric synthesis , stereoselectivity, stable conformation, conformational isomer, conformational transition, conformation occupancy.Studies the activation barrier of the conformational transition, axial and conformational energy of the substituent, anomeric effect.

Purpose of studying of the discipline
To study of the basic provisions of the stereochemistry of organic compounds

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Organic chemistry Mechanisms of organic reactions

Postrequisites
Petrochemistry

Titrimetric methods of analysis

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31792 (3022993)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course covers titrimetric analysis, reaction requirements. Forms an idea about the methods of titration: methods of direct, reverse and substitution titration; method of pipetting and the method of individual portions. Teaches acid-base, redox titration, complexation and precipitation techniques. Reveals the essence of titration indicator errors. Learns the titrants used, indicators, titration conditions, and titrations in non-aqueous media.

Purpose of studying of the discipline

Measuring the volume of a reagent solution of a precisely known concentration consumed for a reaction with an analyte

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Physical methods of research

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31790 (3022991)
Course	3
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course studies the electron spectroscopy of complex molecules. Examines the basic concepts of vibrational spectroscopy, as well as rotational spectroscopy. Presents general information about vibrational- rotational spectroscopy and refractometry. Forms an understanding of spectroscopy in the radio frequency domain. Considers the main points and theoretical foundations of the method of nuclear gamma resonance and mass spectrometry. He studies the fundamentals of spectroscopy in the field of X-rays.

Purpose of studying of the discipline

Understanding the fundamentals, practical possibilities and limitations of the most important physical research methods for chemists, familiarity with their equipment and experimental conditions, the ability to interpret and correctly evaluate experimental data, including those published in the scientific literature

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Photometry in analytical practice

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31791 (3022992)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course studies the types of reactions used in photometry. Considers the choice of the spectral region, the choice of reagent, solvent. Outlines the metrological characteristics of photometric analysis: sensitivity, reproducibility of photometric determinations, range of determined contents. Forms an idea about the choice of optimal conditions and the elimination of the influence of foreign components in photometric determinations. He studies the basics of absolute and differential photometric methods of determination and the extraction-photometric method.

Purpose of studying of the discipline

To study of the theoretical foundations of optical and spectral methods of analysis.

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Electrochemical and optical methods of analysis

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31793 (3022994)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course studies the basic concepts of electrochemical methods: conductometry, potentiometry, coulometry, voltammetry, polarography. Considers the theoretical foundations, the conditions for the analysis, the advantages and disadvantages of the methods. Forms the concept of atomic spectroscopic methods: atomic emission, atomic absorption, atomic fluorescence. Teaches the basic principles of molecular absorption spectroscopy techniques: photocolorimetry, spectrophotometry, turbidimetry, nephelometry. Considers the essence and features of luminescence spectroscopy, as well as vibrational spectroscopy

Purpose of studying of the discipline

Training in the theoretical foundations and practical application of electrochemical and optical analysis methods

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Electrochemical methods of analysis

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31794 (3022995)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines electrode processes. Forms an idea of polarographic methods: classical, differential, normal pulse, differential pulse, alternating current polarography, polarography with fast potential sweep. Teaches the basic concepts of the potentiometry process, including direct and potentiometric titration. Reveals the essence of ionometry, as well as coulometry: amperostatic and potentiostatic. Considers questions on electrogravimetry and conductometry

Purpose of studying of the discipline

Training in the theoretical foundations and practical application of electrochemical analysis methods.

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Spectroscopic methods of analysis

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31798 (3022998)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines the theoretical and practical foundations of spectroscopic methods of analysis. He studies the classification of spectroscopic methods. It reveals the essence, advantages and disadvantages of the methods: electron spectroscopy of complex molecules, vibrational spectroscopy, rotational spectroscopy, vibrational-rotational spectroscopy, refractometry, spectroscopy in the radio frequency region, nuclear gamma resonance method, mass spectrometry, spectroscopy in the field of x-rays. Introduces the types and the main characteristics of the emission spectra. Teaches the technique of experiment of spectroscopic methods of analysis.

Purpose of studying of the discipline

Training in the theoretical foundations and practical application of spectroscopic analysis methods

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Chemical metrology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31799 (3022999)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines the theoretical and practical foundations of chemical metrology. He studies measurements, methods and means of ensuring their unity and the required accuracy. Describes the uncertainties of chemical analysis. Introduces the results and statistical foundations of processing measurement results, criteria for testing statistical hypotheses. Reveals the laws of distribution of observational results and random errors, as well as problems of error theory.

Purpose of studying of the discipline

To teaching students the basic methods of processing the results of quantitative chemical analysis

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Physical chemistry

Postrequisites

Basic and profile disciplines of the EP

Chromatographic separation methods and analysis

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31797 (3022997)

Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the theoretical and practical foundations of chromatography. Studying the classification of chromatographic methods. Reveals the essence, advantages and disadvantages of the theories of chromatography: the concept of "theoretical plates", the kinetic theory. Introduces the types and the main characteristics of chromatograms: width, height and area of the chromatographic peak. Teaches methods of planar chromatography: paper and thin layer. Considers the theoretical foundations and experimental technique of gas, liquid, adsorption, ion-exchange, preparative chromatography.

Purpose of studying of the discipline
Training in the theoretical foundations and practical application of chromatographic separation and analysis methods

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry Physical chemistry

Postrequisites
Basic and profile disciplines of the EP

Petrochemistry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31807 (3023014)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the origin of oil and hydrocarbons. Forms an idea of the chemical, elemental, fractional and group composition of oil, oil products and hydrocarbons. Teaches the basic technological characteristics of oil. Reveals the essence of the classification of oil and oil products. Considers the concept of oil hydrocarbons. He studies heteroorganic compounds of oil and chemical- colloidal properties of oil. Teaches oil exploration methods and oil refining methods.

Purpose of studying of the discipline
To study of the formation of oil fraction, the chemical composition of oil and oil products, as well as the research methods of oil and oil products

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Organic chemistry Multi-core fused and unfused connection

Postrequisites
Basic and profile disciplines of the EP

Problems of complex use of petrochemical products

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31809 (3023016)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	0hours

Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the origin and classification of oil and hydrocarbons. Considers the essence and features of physical properties, elemental composition, fractional composition of oil. He studies shruppovy and structural-group composition of the main oil products, methods for their determination. Forms the concept of elemental analysis of oil and oil products. Reveals the composition and performance properties of petroleum products and the basis for determining the main standardized indicators.

Purpose of studying of the discipline
Study of the integrated use of petrochemical products

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Organic chemistry Multi-core fused and unfused connection

Postrequisites
Basic and profile disciplines of the EP

Production practice II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31806 (3023012)
Course	3
Term	2
Credits count	5
Working practice II	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline
This practice is directed by the organization of work at the enterprises of the chemical industry or in research institutions. Teaches basic professional skills. Studying regulatory and information literature and documentation (GOSTs, TUs, etc.). Forms modern ideas about the integrated use of raw materials, waste processing. Considers the basic methods of labor protection and safety in chemical laboratories and workshops.

Purpose of studying of the discipline
Transferring the knowledge gained by students in educational laboratories to production and technological schemes of production

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Production practice III

Modern technologies of deep processing of oil, gas and coal

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31808 (3023015)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course studies the technology of gas processing, technology of oil and gas condensate preparation for processing. Considers the technology of oil and gas processing and production of commodity products. Studies the current state of development of the fuel and energy complex. Forms the concept of the basics of petrochemistry and petroleum products. Teaches the basics of chemical chemistry of fuel and oil, the theoretical foundations and technologies of physicochemical processes used in modern oil refineries.

Purpose of studying of the discipline

Study of fractional and elemental composition of oil, methods of oil production and refining

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Organic chemistry Multi-core fused and unfused connection

Postrequisites

Basic and profile disciplines of the EP

Coordination chemistry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31825 (3023024)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course describes complex compounds and their derivatives, studies their classification, nomenclature, stability, dissociation. Considers the main provisions of Werner`s coordination theory. He studies the structure of complex compounds and the theory of the structure of complex compounds. It reveals the essence of the theory of the crystal field, the theory of the field of ligands, and also considers ligands of strong and weak fields. Forms the basic concepts of the types of complex compounds with inorganic ligands, with organic ligands.

Purpose of studying of the discipline

To consider the basic concepts of the chemistry of coordination compounds; to study representatives of individual classes of coordination compounds, their nomenclature, parameters of chemical bonds in molecules, their geometric configuration, types of isomerism.

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry

Postrequisites

Basic and profile disciplines of the EP

Analysis of inorganic substances

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31819 (3023005)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

This course examines methods for isolating, separating and concentrating inorganic compounds. Teaches analytical methods of qualitative analysis: composition and purity, analysis of inorganic compounds. Forms an idea of the substances of special purity and the definition of impurity and alloying microelements in them. He studies the basics of the analytical method for the quantitative determination of inorganic substances. Considers the basics of physicochemical methods for the analysis of inorganic compounds.

Purpose of studying of the discipline

To study of the theoretical foundations of qualitative and quantitative analysis of inorganic substances

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry

Postrequisites

Basic and profile disciplines of the EP

Analysis of oil and petroleum products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31821 (3023007)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines the theories and classification of oil. Considers the essence of physical properties, elemental composition, fractional composition of oil and oil products. He studies the basics of the group and structural-group composition of the main oil products, methods for their determination. Forms the concept of elemental analysis of oil and oil products. Studies the composition and performance properties of petroleum products. Teaches the definition of the main normalized indicators according to GOST.

Purpose of studying of the discipline

To acquire knowledge about the processes of oil formation, fractional and chemical composition of oil and oil products, quality requirements, methods of analysis of oil and oil products.

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry Petrochemistry

Postrequisites

Basic and profile disciplines of the EP

Analysis of organic substances

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31820 (3023006)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The course studies the methods of isolation, separation and concentration of organic compounds. Teaches analytical methods of qualitative analysis: composition and purity, analysis of organic compounds. Studies the elemental analysis of organic compounds for the description of C, H, O, S, N, P. Studies substances of high purity; determination of trace amounts of impurities in them. Considers analytical methods for the quantitative determination of organic substances. Reveals physico-chemical methods of analysis of organic compounds. IR spectroscopy of organic compounds.

Purpose of studying of the discipline

Training in the theoretical foundations of analysis organic substances

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites

Analytical chemistry

Postrequisites

Basic and profile disciplines of the EP

The analysis of natural objects

Discipline cycle	Profiling discipline

Discipline component	Electives
SubjectID	31818 (3023004)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
This course examines the features of the analysis of natural objects: water, air, soil, geological objects, minerals, biological objects. Teaches the basic methods of sampling, preparing samples for analysis. Teaches methods of mineralization, concentration and separation, identification and quantification of components of natural objects. Studying the basics of determining the characteristics of soil, water. Examines the methods of automasing and biological analysis.

Purpose of studying of the discipline
training in the theoretical foundations of analysis and methods of chemical and physico-chemical analysis of various natural objects, working out the skills of laboratory experiments and theoretical conclusions based on the results of experimental observations.

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry

Postrequisites
Basic and profile disciplines of the EP

Catalytic processing of heavy oil fraction

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31823 (3023009)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course studies the chemical composition and physical properties of oil. He studies the distillation of oil, the classification of commercial petroleum products. Forms the concept of catalytic processes, thermal processes of oil refining and heavy oil fractions. He studies the theory and practice of hydrocatalytic processes for the processing of petroleum fractions. Teaches the basics of refinery gas processing. Considers the essence of the fundamentals of oil production technology. Reveals industrial schemes of modern oil refineries.

Purpose of studying of the discipline
Study of the regularity of the processing of heavy oil by the catalytic method

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry Petrochemistry

Postrequisites
Basic and profile disciplines of the EP

Methods of scientific research in the field of chemistry

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	31829 (3024007)
Course	4
Term	1
Credits count	3

Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The course studies the main fundamental and applied scientific directions in the field of chemistry. Teaches reading and referencing chemistry literature. Considers the methodological basis of scientific research in chemistry. Studied fundamental research in chemistry, chemical engineering and materials sciences. Considers the essence and features of modern scientific research in the field of chemistry. Forms the concept of theoretical and experimental research methods in the chemical field.

Purpose of studying of the discipline
Formation of students` ability to analyze the results of scientific research and apply them in solving specific educational and research problems

Learning Outcomes
ON3 Use theoretical foundations of the fundamental sections of chemistry in the solution of professional competence
ON5 Use knowledge of applied chemistry in professional activities

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Undergraduate practice

Utilization of sulfur and sulfur-organic compounds of oil

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31822 (3023008)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the theoretical and practical methods of utilization of sulfur and organosulfur compounds of oil. Learns the basic properties of sulfides, sulfoxides and sulfones and how to use them. Forms the concept of the chemistry of reactions, the main types and mechanism of action of catalysts. Teaches the basics of oil refining and petrochemical synthesis knowing the main types of sulfur compounds that make up oil, as well as ways to dispose of them.

Purpose of studying of the discipline
Have a basic understanding of the disposal and further use of sulfur compounds of oil

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry Petrochemistry

Postrequisites
Basic and profile disciplines of the EP

Chemical Synthesis

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31826 (3023025)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
The course studies the most important sources of information about the ways of synthesis of inorganic and coordination compounds. Considers the theoretical foundations of inorganic synthesis. Teaches the basic methods of separating, concentrating and purifying inorganic substances. Reveals chemical transport reactions. Forms an idea of reactions in the gas phase. Teaches solid phase synthesis methods and methods for the synthesis of anhydrous inorganic compounds. Reveals the production of simple substances, oxides, halides, hydrides, hydroxides, acids, salts.

Purpose of studying of the discipline
To study of methods and techniques of synthesis of inorganic substances

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry

Postrequisites
Basic and profile disciplines of the EP

Chemicals metal

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31827 (3023026)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines and studies the position of metals in the periodic system and the features of the electronic structure of their atoms. Forms an idea of the physical and chemical properties of metals, their oxides and hydroxides of these metals. Teaches chemical and electrochemical corrosion of metals. Reveals the essence of protection against corrosion and the general characteristics of metals of the main subgroups of I-III groups of the periodic system of chemical elements of D.I. Mendeleev.

Purpose of studying of the discipline
To generate ideas about how metals chemical elements and simple substances like metals. Give the concept of metal links and metal lattice, some methods for producing metal

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems

Prerequisites
Analytical chemistry

Postrequisites
Basic and profile disciplines of the EP

Undergraduate practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31831 (3023027)
Course	4
Term	2
Credits count	8
Undergraduate practice	240hours
Total	240hours
Knowledge control form	Total mark on practice

Short description of discipline
The practice is aimed at applying the knowledge gained in the educational program in practical activities. Conducts preparation for writing a thesis or project. Teaches holding events aimed at the fullest possible disclosure of their knowledge and skills. Studying the work of the organization, identifying problems in its activities and suggesting ways to solve them. Reveals the development of personal qualities in professional and scientific activities.

Purpose of studying of the discipline
a detailed study of the organizational structure of the enterprise and its current management system, process, equipment operation, control, issues of life safety, economic production indicators, selection of necessary materials on the topic of graduation design (work)

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON9 To master scientific thinking and the ability to solve problems in the scientific and industrial direction

Prerequisites

Basic and profile disciplines of the EP Methods of scientific research in the field of chemistry

Postrequisites

Final examination

Production practice III

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31832 (3023036)
Course	4
Term	2
Credits count	8
Working practice	240hours
Total	240hours
Knowledge control form	Total mark on practice

Short description of discipline

The practice is aimed at consolidating the theoretical knowledge of specialized disciplines in production or a research center. Examines the activities of the organization and its main indicators. Teaches hands-on experience in chemical production. Uncovers scores and proposes technology-based solutions to improve organizational performance. It gives the student the opportunity to qualitatively prepare for writing and defending his final qualifying work.

Purpose of studying of the discipline

a detailed study of the organizational structure of the enterprise and its current management system, process, equipment operation, control, issues of life safety, economic production indicators, selection of necessary materials on the topic of graduation design (work)

Learning Outcomes

ON5 Use knowledge of applied chemistry in professional activities
ON9 To master scientific thinking and the ability to solve problems in the scientific and industrial direction

Prerequisites

Basic and profile disciplines of the EP Production practice II

Postrequisites

Final examination

Module 6. Mastery of knowledge in the field of pedagogy, methods teaching chemistry

Pedagogy

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31817 (3023034)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline is aimed at forming students` holistic understanding of the theoretical and methodological foundations of pedagogical science and the essence of professional pedagogical activity. Studying the course allows you to form the necessary knowledge about the content, principles, forms and methods of organizing a holistic pedagogical process in an educational environment. The study of the course forms the necessary competencies for the successful implementation of modern approaches in teaching and learning.

Purpose of studying of the discipline

Pedagogy as an academic discipline aims to form students` knowledge about the object and subject of pedagogy, its functions, categorical apparatus, methodology of science. The study of the course provides for the formation of the necessary competencies in the design and evaluation of the pedagogical process in the conditions of an educational institution.The content of the discipline topics allows you to acquire knowledge and skills in the selection and successful application of forms, means, methods of teaching and upbringing.

Learning Outcomes

ON7 Own knowledge in the field of pedagogy,methods teaching chemistry

Prerequisites

General chemistry The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites

Basic and profile disciplines of the EP Pedagogical practice

Methods of Teaching Chemistry

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	31824 (3023010)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

This course examines the pedagogical basis of teaching chemistry. Teaches the basic methods of teaching school and secondary special courses in chemistry. Considers systems of teaching aids. Studying modern methods of teaching in chemistry. Teaches the basics of demonstration experiments and their techniques. Reveals the essence of the organization of practical classes. Forms an idea of algorithms for solving problems in the theoretical and practical parts of chemistry.

Purpose of studying of the discipline

Improving the quality of training of specialists, the formation of natural scientific and technological knowledge in chemistry and related skills, the formation of a socially active personality

Learning Outcomes

ON7 Own knowledge in the field of pedagogy,methods teaching chemistry

Prerequisites

Basic and profile disciplines of the EP General chemistry

Postrequisites

Pedagogical practice

Pedagogical practice

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	31830 (3022957)
Course	4
Term	2
Credits count	7
Pedagogical practics	210hours
Total	210hours
Knowledge control form	Total mark on practice

Short description of discipline

Practice studies the conditions of pedagogical activity, consolidation of the received theoretical knowledge in special subjects. Teaches necessary methods and skills for the profession. Studying teaching methods and pedagogical experience of teachers using the developed pedagogical methods. Examines communication and research skills, work in the field of teaching methods of the academic discipline. Forms students` professional and pedagogical skills.

Purpose of studying of the discipline

studying the fundamentals of pedagogical and educational- methodical work in higher educational institutions, mastering the pedagogical skills of conducting certain types of training sessions in the disciplines of the profile corresponding to the direction of study.

Learning Outcomes

ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems
ON7 Own knowledge in the field of pedagogy,methods teaching chemistry

Prerequisites

Methods of Teaching Chemistry Pedagogy

Postrequisites

Undergraduate practice

Module 7. Usage environmental knowledge in decision professional tasks

Ecological Chemistry

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	31785 (3023021)
Course	2
Term	2
Credits count	5
Lections	15hours

Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the theoretical and practical foundations of environmental chemistry. Reveals the tasks of ecodiagnosis and ecoprophylaxis. Describes a chemical pollutant in the environment; stability and degradability. Studies the chemical transformations of pollutants in natural environments. Considers the ecological chemistry of the atmosphere, hydrosphere, soil. Reveals the essence of the impact of chemical production on the environment, as well as protection technology. Teaches experimental methods of ecological and chemical research and control of environmental objects.

Purpose of studying of the discipline
To study of the transformation of chemical compounds in the environment, forecasting the possible consequences of such changes and the formation of decision-making skills taking into account environmental requirements

Learning Outcomes
ON8 Use ecological knowledge in professional activity

Prerequisites
General chemistry

Postrequisites
Basic and profile disciplines of the EP

Fundamentals of Chemical Toxicology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31812 (3023023)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the theoretical and practical foundations of chemical toxicology. Reveals the essence of the basic concepts and objects of chemical toxicology. Considers the classification of toxic substances. Forms an idea of the physicochemical and biochemical methods for the determination of toxic and potent substances. Teaches methods of detecting, identifying and neutralizing poisonous and highly active substances. He studies the meaning and characteristics of individual groups of toxic substances.

Purpose of studying of the discipline
To formation of the necessary knowledge on the methodology of systemic chemical and toxicological analysis, taking into account their professional activities in the field of chemical and environmental expertise

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON8 Use ecological knowledge in professional activity

Prerequisites
General chemistry

Postrequisites
Basic and profile disciplines of the EP

Chemical transformations of pollutants

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	31811 (3023022)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
This course examines the chemistry of the main environmental pollution (atmospheric air, water, soil, plants and animals). Studies the chemical transformations of organic and inorganic pollutants in the environment, the impact of pollutants on flora and fauna. Reveals the chemical interactions of organisms with each other and with the environment. Teaches physical and chemical methods of studying and eliminating harmful effects on the environment.

Purpose of studying of the discipline
To development of knowledge and formation of a holistic view of the processes and phenomena of the physical and chemical interaction of pollutants with environmental components

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON8 Use ecological knowledge in professional activity

Prerequisites
General chemistry

Postrequisites
Basic and profile disciplines of the EP

Radiation Chemistry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31816 (3023018)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course studies high energy chemistry, chemical processes caused by the action of ionizing radiation on matter. Reveals the basic concept of the ionizing ability of electromagnetic radiation (synchrotron radiation, X-rays, γ-radiation) and acceleration flows. Considers unusual chemical processes that are impossible with traditional chemical methods. Teaches the main points of ionizing radiation and the processes occurring in the irradiated environment.

Purpose of studying of the discipline
The study of the phenomenon of radioactivity, the principles of RB, methods of protecting the environment from radioactive pollutants

Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON8 Use ecological knowledge in professional activity

Prerequisites
Ecological Chemistry

Postrequisites
Basic and profile disciplines of the EP

Man-made systems and environmental risk

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31814 (3023002)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course studies the anthropogenic impact on the environment. Reveals the basics of ecotoxicants and methods for assessing their impact. Considers diagnostics and chemical-ecological control of environmental objects. Forms an idea of the main directions and methods for combating environmental pollution. Teaches methods of wastewater treatment, atmosphere, waste disposal. Studying the basics of the theory of dangers, classification and levels of the scale of dangers.

Purpose of studying of the discipline
To study of modern conceptual frameworks and methodological approaches to sustainable human interaction with the natural environment and safe functioning of technological systems
Learning Outcomes
ON6 Apply knowledge of the basics of instrumental chemistry to solve scientific and applied problems
ON8 Use ecological knowledge in professional activity
Prerequisites
Ecological Chemistry
Postrequisites
Basic and profile disciplines of the EP

Chemistry of environmental objects and rare metal raw materials

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31815 (3023003)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course studies the chemistry of the main environmental pollution (atmosphere, water, soil, plants). Forms an idea of the chemical transformation of pollutants in the environment and the impact of pollutants on flora and fauna, chemical interactions of organisms with each other and with the environment. Studies the migration and transformation of all chemical compounds. Teaches the basic methods of eliminating harmful environmental impacts.
Purpose of studying of the discipline
Study of changes in the chemical composition of the environment and prediction of possible environmental consequences on their basis, the method of processing, decomposition and separation of rare-metal raw materials
Learning Outcomes
ON5 Use knowledge of applied chemistry in professional activities
ON8 Use ecological knowledge in professional activity
Prerequisites
Ecological Chemistry
Postrequisites
Basic and profile disciplines of the EP

Final examination

Writing and defending a thesis or preparing and passing a comprehensive exam.

Diploma work

Credits count	8

Comprehensive exam

Credits count	8

4.Summary table on the scope of the educational program

«6B05301 - Chemistry»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh language	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Russian language	GER/CC	1	5	150		45		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Kazakh language	GER/CC	2	5	150		45		35	70	Examination
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Russian language	GER/CC	2	5	150		45		35	70	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	15	30		35	70	Examination
Module 2. Application of mathematical methods and physical phenomena and laws in practice										
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Solving problems of chemistry and chemical technology by computer software	AS/CCh	6	5	150	15	15	15	35	70	Examination
Chemical Physics	AS/US	7	5	150	15	30		35	70	Examination
Module 3. Usage theoretical foundations of fundamental sections of chemistry in solving professional problems										
Introduction to the profession	BS/US	1	3	90	15	15		20	40	Examination
General chemistry	BS/US	1	3	90	15	0	15	20	40	Examination
Inorganic chemistry	BS/US	2	5	150	15	15	15	35	70	Examination
Educational practice	BS/US	2	2	30						Total mark on practice

Analytical chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Organic chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Solving problems in general and inorganic chemistry	BS/US	3	5	150		45		35	70	Examination
Physical chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Colloidal chemistry	BS/US	5	5	150	15	0	30	35	70	Examination
Module 4. Mastering the methods of synthesis, modification and technology for the production of chemicals and materials										
Mechanisms of organic reactions	BS/US	4	5	150	15	30	0	35	70	Examination
Chemical functional derivatives of organic molecules	BS/US	4	5	150	15	15	15	35	70	Examination
Chemistry of organometallic compounds	BS/CCh	6	5	150	15		30	35	70	Examination
Analysis of minerals	BS/CCh	6	5	150	15	0	30	35	70	Examination
low-waste technology	BS/CCh	6	5	150	15	0	30	35	70	Examination
Fundamentals of technological processes in industry	BS/CCh	6	5	150	15	0	30	35	70	Examination
Macromolecular Chemistry	BS/CCh	6	5	150	15		30	35	70	Examination
Chemistry of Natural Compounds	BS/CCh	6	5	150	15		30	35	70	Examination
Fundamentals of Biochemistry	AS/US	6	5	150	15		30	35	70	Examination
Module 5. Use of knowledge in applied and instrumental chemistry in professional activities										
Chemical terminology in English	BS/US	3	3	90		30		20	40	Examination
Analytical chemistry of trace amounts	BS/CCh	4	5	150	15	15	15	35	70	Examination
Quantitative analysis in Inorganic Chemistry	BS/CCh	4	5	150	15	15	15	35	70	Examination
Production practice I	BS/US	4	5	150						Total mark on practice
The chemical quantitative analysis	BS/CCh	4	5	150	15	15	15	35	70	Examination
Heterocyclic compounds	BS/CCh	5	5	150	15	15	15	35	70	Examination
Multi-core fused and unfused connection	BS/CCh	5	5	150	15	15	15	35	70	Examination
Optical analysis methods	BS/CCh	5	5	150	15	0	30	35	70	Examination
Stereochemistry of organic compounds	BS/CCh	5	5	150	15	15	15	35	70	Examination
Titrimetric methods of analysis	BS/CCh	5	5	150	15	15	15	35	70	Examination
Physical methods of research	BS/CCh	5	5	150	30	15	0	35	70	Examination
Photometry in analytical practice	BS/CCh	5	5	150	15	15	15	35	70	Examination
Electrochemical and optical methods of analysis	BS/CCh	5	5	150	15	0	30	35	70	Examination
Electrochemical methods of analysis	BS/CCh	5	5	150	15	0	30	35	70	Examination
Spectroscopic methods of analysis	AS/CCh	5	5	150	15	0	30	35	70	Examination
Chemical metrology	AS/CCh	5	5	150	15	0	30	35	70	Examination
Chromatographic separation methods and analysis	AS/CCh	5	5	150	15	0	30	35	70	Examination
Petrochemistry	BS/CCh	6	5	150	15	0	30	35	70	Examination

Problems of complex use of petrochemical products	BS/CCh	6	5	150	15	0	30	35	70	Examination
Production practice II	BS/US	6	5	150						Total mark on practice
Modern technologies of deep processing of oil, gas and coal	BS/CCh	6	5	150	15	0	30	35	70	Examination
Coordination chemistry	AS/CCh	7	5	150	15	0	30	35	70	Examination
Analysis of inorganic substances	AS/CCh	7	5	150	15	0	30	35	70	Examination and term work/Project
Analysis of oil and petroleum products	AS/CCh	7	5	150	15	0	30	35	70	Examination
Analysis of organic substances	AS/CCh	7	5	150	15	0	30	35	70	Examination and term work/Project
The analysis of natural objects	AS/CCh	7	5	150	15	0	30	35	70	Examination and term work/Project
Catalytic processing of heavy oil fraction	AS/CCh	7	5	150	15	0	30	35	70	Examination
Methods of scientific research in the field of chemistry	AS/US	7	3	90	15	15		20	40	Examination
Utilization of sulfur and sulfur-organic compounds of oil	AS/CCh	7	5	150	15	0	30	35	70	Examination
Chemical Synthesis	AS/CCh	7	5	150	15	15	15	35	70	Examination
Chemicals metal	AS/CCh	7	5	150	15	15	15	35	70	Examination
Undergraduate practice	AS/CCh	8	8	240						Total mark on practice
Production practice III	AS/CCh	8	8	240						Total mark on practice
Module 6. Mastery of knowledge in the field of pedagogy, methods teaching chemistry										
Pedagogy	BS/US	7	3	90	15	15		20	40	Examination
Methods of Teaching Chemistry	AS/US	7	6	180	30	30	0	40	80	Examination
Pedagogical practice	AS/US	8	7	210						Total mark on practice
Module 7. Usage environmental knowledge in decision professional tasks										
Ecological Chemistry	AS/US	4	5	150	15	15	15	35	70	Examination
Fundamentals of Chemical Toxicology	AS/CCh	6	5	150	15	15	15	35	70	Examination
Chemical transformations of pollutants	AS/CCh	6	5	150	15	15	15	35	70	Examination
Radiation Chemistry	BS/CCh	7	5	150	15	30	0	35	70	Examination
Man-made systems and environmental risk	BS/CCh	7	5	150	15	30	0	35	70	Examination
Chemistry of environmental objects and rare metal raw materials	BS/CCh	7	5	150	15	30	0	35	70	Examination
Final examination										
Diploma work		8	8	240						
Comprehensive exam		8	8	240						