F.7.02-09

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.AUEZOV South Kazakhstan University

 «APPROVED»

Chairman of the board -

 Rector \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Doctor of historical sciences,

Academician, Kozhamzharova D.P.

 «\_\_\_»\_\_\_\_\_\_\_\_\_\_2024

**EDUCATIONAL PROGRAMME**

**6В05320** -**«Chemistry»**

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| --- | --- |
| R[egistrationnumber](https://context.reverso.net/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/Registration%2Bnumber) | 6В05300009 |
| Code and classification of the field of education | 6B05 - Natural sciences, mathematics and statistics |
| Code and classification of training areas | 6B053 - Physical and chemical sciences |
| Group of educational programs | В053 - Chemistry |
| Type of EP | Acting  |
| ISCE level | 6 |
| NQF level | 6 |
| ІQF of education level | 6 |
| Language of learning | Kazakh. Russian |
| The complexity of the EP, not less | 240 credits |
| Distinctive features of EP |  |
| Partner University (JEP) - | - |
| University Partner ( TDEP ) | - |

Shymkent, 2024

Developers:

|  |  |  |
| --- | --- | --- |
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The educational program was considered at a meeting of the academic committee in the direction of training "Natural Sciences",

Minutes No. \_\_\_\_ dated "\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_ 2024

Chairman of the Academic Committee \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Madiyarov N.K.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU

Minutes # « » 2024 y.

The EP was approved by the decision of the Academic Council of the University

Minutes # « » 2024 y.

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**1. CONCEPT OF THE PROGRAM**

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| --- | --- |
| **University Mission** | Generation of new competencies, preparation of a leader who translates research and entrepreneurial thinking and culture |
| **University Values** | * Openness – open to change, innovation and cooperation.
* Creativity - generates ideas, develops them and turns them into values.
* Academic freedom - free to choose, develop and act.
* Partnership – builds trust and support in relationships where everyone wins.
* Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
 |
| **Graduate Model** | * Deep subject knowledge, its application and constant expansion in professional activity.
* Information and digital literacy and mobility in a rapidly changing
* environment.
* Research skills, creativity and emotional intelligence.
* Entrepreneurship, independence and responsibility for their activities
* and well-being.
* Global and national citizenship, tolerance for cultures and languages.
 |
| **The uniquenessoftheeducationalprogram** | Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders• Practical orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow to be functionally literate and competitive in any life situation and be in demand in the labor market6В05320 -“Chemistry” in the preparation of a harmoniously and comprehensively developed personality, with high creative initiative, innovative potential, possessing natural - scientific, humanitarian, general professional and special knowledge.A dual form of training is provided for EP in accordance with employers' contracts - Operational and forensic management at the DP of Shymkent, in order to combine theoretical training at a university and acquire practical skills for working in organizations of South Kazakhstan.  |
| **Academic Integrity and Ethics Policy** | The university has taken measures to maintain academic honesty and academic freedom, protection from any kind of intolerance and discrimination:• Rules of academic integrity (protocol of the Academic Council No. 3 dated October 30, 2018);• Anti-Corruption standard (Order No. 373 n/k dated December 27, 2019).* Code ofEthics (Protocol ofthe Academic Council No. 8 datedJanuary 31, 2020).
 |
| **Regulatory and legal frameworkforthedevelopmentofEP** | 1. Law of the Republic of Kazakhstan "On Education";2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 with amendments and additions dated December 29, 2021 No. 6143. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated July 20.2022 No. 2;4. Rules for organizing the educational process on credit technology of education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152;5. Qualification directory of positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553.6. Guidelines for the use of ECTS.7. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the Center for the Bologna Process and Academic Mobility No. 45 o / d dated June 30, 2021 |
| **Organization of the educational process** | • Implementation oftheprinciplesofthe Bologna Process• Student-centeredlearning• Availability• Inclusiveness |
| **Quality assurance of the Educational program** | • Internal quality assurance system• Involvement of stakeholders in the development of the Educational Program and its evaluation• Systematic monitoring• Actualization of the content (updating) |
| **Requirementsforapplicants** | It is established according to the Model Rules for admission to training in educational organizations, implementing educational programs of higher and postgraduate education, Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018 |

**2.PASSPORT of the Educational program**

|  |  |
| --- | --- |
| **PurposeoftheEP** | Training of competitive graduates of a new formation with skills and competencies in the field of chemical, environmental and forensic expertise for the implementation of scientific, professional and practical activities. |
| **Tasks of the EP** | •the formation of socially responsible behavior in society, understanding the importance of professional ethical standards for the development of personality; •the formation of skills and learning skills that make it possible to successfully adapt to the changing conditions of the labor market, for the development of professional potential, initiative and innovation, with the continuation of education at the next stage of higher professional education;•creating conditions for the development of skills in conducting scientific research in the field of chemical, environmental and forensic expertise.  |
| **HarmonizationofEP** | **•** 6th level of the National Qualifications Framework of the Republic of Kazakhstan;• Dublin descriptors of the 6th level of qualification;• 1 cycle of a Framework for Qualification of the European Higher Education Area);• 6thLevel of European Qualification Framework for Life long Learning). |
| **Connection of the EP with the professional sphere** | * The sectoral qualifications framework for the education sector (Approved by Protocol No. 2 of the Meeting of the sectoral three-party commissions on social partnership and regulation of social and labour relations under the Ministry of Education and Science of the Republic of Kazakhstan dated November 23, 2016;
* Professional standard: "Teacher", approved by the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 133 dated June 8, 2017
* and with Appendix 2 to the Oil and Gas Refining and Marketing Industry Qualifications Framework; Appendix No. 31 dated December 27, 2019 No. 266 "Quality control of oil, oil products".
 |
| **Name of the degree awarded** | After the successful completion of this EP, the graduate is awarded Bachelor of Science in the educational program "6B05320-Chemistry"code and name of the educational program" |
| **List of qualifications and positions** | Bachelor of Natural Science on Educational Program "6В05320-Chemistry»-laboratory assistant, researcher, chemist in research institutions, in production-management and educational organizations without presenting requirements for work experience in accordance with the qualification requirements,college teacher. |
| **Field ofprofessionalactivity** | - area of education;- the spheres of the chemical, pharmaceutical, food, petrochemical, metallurgical industries;- research area;- ecology and environmental protection; |
| **Objectsofprofessionalactivity** | - production laboratories of analytical, environmental, customs, sanitary-epidemiological, certification services;-operative and forensic management;-scientific research organizations (institutes, laboratories) of chemical, environmental, petrochemical, nuclear, metallurgical profile;- secondary technical educational institutions of the education department;- sectoral scientific-research and design institutes. |
| **Subjectsofprofessionalactivity** | -chemical analysis;- quality control of goods, products, substances and materials;- monitoring;- educational process. |
| **Typesofprofessionalactivity** | The bachelor in the educational program 6В05320 -“Chemistry” can perform the following types of professional activities: -expert-chemical;- scientific - research; - production and management; - pedagogical. |
| **Learning outcomes** | **LО1**Demonstrate social, natural science, socio-economic and environmental knowledge and methods of scientific and experimental research in personal and professional activities;**LО2**Communicate freely in a professional environment and society in Kazakh, Russian and English, possessing ideological, civil, spiritual responsibility, academic honesty and decency.**LО3** Demonstrate digital and computational literacy by using digital technologies to search and store information.**LО4** Demonstrate the ability to determine the conditions and parameters of research using experimental data processing methods. **LО5** Establish the chemical composition, nature and properties of various substances and materials based on theoretical knowledge of fundamental chemistry; **LО6** Be proficient in modern methods of physical-chemical and chemical-technological analysis with interpretation of the results.**LО7** Demonstrate the ability to carry out the synthesis of new compounds and products using theoretical and experimental research methods;**LО8** Determine the structure, composition and chemical properties of compounds and products, raw materials using scientific research methods;**LO9**Analyze and process the results of the analysis of products of various industries and the environment to formulate conclusions and conclusions; **LO10** Demonstrate the ability to conduct chemical and technical analysis of raw materials and the quality of finished products;**LО11** Integrate and apply research, entrepreneurial and uncertainty skills;**LO12**Work effectively individually and in a team, demonstrating the ability to be independent through self-education and self-education. |

**3. COMPETENCES OF THE EP GRADUATE**

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| --- |
| **GENERALCOMPETENCE**(SOFTSKILLS). Behavioral skills and personality traits |
| GC 1.Competence in managing one's own literacy | GC 1.1. The ability to self-learn, self-develop and constantly update their knowledge within the chosen trajectory and in an interdisciplinary environment.OK1.2. Ability to express thoughts, feelings, facts and opinions in the professional field.OK1.3. Ability for mobility in the modern world and critical thinking. |
| GC 2. Language competence | GC2.1. The abilitytobuildcommunicationprograms in thestate, Russian and foreignlanguages.GC 2.2. The ability for interpersonal social and professional communication in conditions of intercultural communication. |
| GC 3. Mathematical and Science Competence | GC3.1.Theability and willingnesstoapplytheeducational potential, experience and personal qualitiesacquiredduringthestudyofmathematical, naturalscience, technicaldisciplines at theuniversitytosolve professional problems. |
| GC 4. Digital competence, technological literacy | GC 4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of their lives and professional activities.GC4.2.The ability to use various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, protecting and disseminating information. |
| GC 5. Personal, social and academic competencies | GC 5.1.The ability for physical self-improvement and focus on a healthy life to ensure a full-fledged social and professional activity through the methods and means of physical culture.GC 5.2.The ability to socio-cultural development based on the manifestation of citizenship and morality.GC 5.3 The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success.GC 5.4. The ability to successfully interact in a variety of socio-cultural contexts at school, at work, at home and at leisure. |
| GC 6. Entrepreneurialcompetence | GC 6.1. Ability tobecreative and entrepreneurial in a varietyofenvironments.GC 6.2. The abilitytowork in a modeofuncertainty and rapidlychangingtaskconditions, makedecisions, allocateresources and manage your time.GC 6.3. Ability toworkwithconsumerrequests. |
| GC 7. Cultural awareness and ability to express yourself | GC 7.1. The abilitytoshowworldview, civil and moralpositions.GC 7.2. The abilitytobe tolerant ofthetraditions and cultureofotherpeoplesoftheworld, tohave high spiritual qualities. |
| **PROFESSIONAL COMPETENCES**(HARDSKILLS).  |
| Theoretical knowledge and practical skills specific to this area | PC-1 Ability to apply the basic laws of natural sciences to explain the quantum-chemical representation of the state of matter; the ability to formulate knowledge of the theoretical foundations of modern chemistry from the standpoint of atomic and molecular science, including with the involvement of information technology |
| PC-2 Ability to use theoretical knowledge and experimental skills in conducting chemical qualitative and quantitative analysis of the properties and composition of materials, the ability to demonstrate knowledge of conducting a chemical experiment with the possibility of modeling it and processing the results obtained |
| PC-3Ability to master modern methods of analysis of chemical compounds, physical and chemical calculations, mathematical modeling of experiments, the ability to explain real chemical processes |
| PC-4 Ability to set goals and objectives related to the implementation of professional knowledge in various industries, the ability to use knowledge in their professionaland educational activities |
| PC-5 Ability to implement experimental calculation methods in solving various tasks of the educational, scientific direction and adapt them to solving production processes, correctly formulate the research task |
| PC-6Ability to study and analyze domestic and foreign scientific and technical literature; apply modern physical and chemical research methods, plan experimental studies, obtain, process and analyze the results obtained |

**3.1 Matrix of correlating the learning outcomes of the EP in general with the formed competencies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **LО1** | **LО2** | **LО3** | **LО4** | **LО5** | **LО6** | **LО7** | **LО8** | **LО9** | **LО10** | **LО11** | **LО12** |
| GC 1 | + |  |  |  |  |  |  |  |  |  | + | + |
| GC 2 |  | + |  |  |  |  |  |  |  |  |  | + |
| GC 3 | + |  |  | + | + |  |  | + |  |  |  |  |
| GC 4 |  |  | + |  |  |  |  |  |  |  | + | + |
| GC 5 | + |  |  |  |  | + |  | + | + |  |  | + |
| GC 6 |  | + |  |  |  |  |  | + |  |  | + | + |
| GC 7 |  |  |  |  |  |  |  |  |  |  | + | + |
| PC 1 | + |  | + |  | + |  | + |  |  |  |  |  |
| PC 2 |  |  |  | + | + |  |  | + |  | + |  |  |
| PC 3 |  |  |  |  |  | + | + |  |  | + | + |  |
| PC 4 | + | + |  |  |  |  |  |  |  |  | + | + |
| PC 5 |  |  |  | + | + | + |  | + | + |  |  |  |
| PC 6 |  |  |  |  |  | + | + | + | + |  | + |  |

**4. MATRIX OF THE INFLUENCE OF DISCIPLINES ON FORMATION OF LEARNING OUTCOMES AND INFORMATION ON LABOR INTENSITY**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **№** | **Module name** | **cycle** | **component** | **Name of the discipline** | **Brief course description** | **Num****berof credits** | **Formed learning outcomes (codes)** |
| **LО1** | **LО2** | **LО3** | **LО4** | **LО5** | **LО6** | **LО7** | **LО8** | **LО9** | **LО10** | **LО11** | **LО12** |
| 1 | Public sciences Module | GED | CC | History of Kazakhstan | The purpose of the discipline is formation of an objective idea of the history of Kazakhstan based on a deep understanding and scientific analysis of the main stages, patterns and originality of the historical development of Kazakhstan.Ancient people and the formation of nomadic civilization. Turkic civilization and the great steppe. Kazakh Khanate. Kazakhstan in the era of modern times. Kazakhstan as part of the Soviet administrative-command system. Declaration of Independence of Kazakhstan.State system, socio-political development, foreign policy and international relations of the Republic of Kazakhstan. Methods and techniques of historical description for the analysis of the causes and consequences of events in the history of Kazakhstan. | 5 | **v** | **v** |  |  |  |  |  |  |  |  |  | **v** |
| 2 | GED | CC | Philosophy | The purpose of the discipline isFormation of a culture of philosophical thinking among students, transfer of knowledge of a methodological nature. Education involves assistance in choosing the right life orientations and solving meaningful life problems.Students will be able to carry out the study of ontology and metaphysics in the context of the historical development of philosophy;specifics of philosophical understanding of reality; classification of methods of scientific and philosophical knowledge of the world.Formulate and competently argue their own moral position in relation to the current problems of the modern global society, problems in the professional field, and present the results for discussion. | 5 | **v** | **v** |  |  |  |  |  |  |  |  |  | **v** |
| 3 | Module of socio-political knowledge  | GED | CC | Social and political science | The purpose of the discipline isFormation of scientific knowledge about the socio-political structure of modern society, about the mechanism for implementing power decisions, in mastering the main methods for measuring various models of political systems and regimes, social phenomena and their relationship with political processes.Students will be able to consider the socio-ethical values of society; the nature of situations in various spheres of social communication from the standpoint of correlation with the system of values, the norms of Kazakhstani society;features of social, political, cultural, psychological institutions in the context of their role in the modernization of Kazakhstani society.Formulate solutions for resolving conflict situations in society, including in a professional society. | 4 | **v** | **v** |  |  |  |  |  |  |  |  |  | **v** |
| 4 | GED | CC | Cultural studies and psychology | The purpose of the discipline isTo form students' ideas about culture as the highest human value and to promote the development of their needs in the independent development of cultural values; to acquaint students with the history of cultural thought; reveal the essence of the main problems of modern cultural studies.Students will be able to study and analyze the culture of the Kazakh people and civilization in their interaction, the multivariance of the historical process;citizenship and patriotism, the desire to serve the interests of the Fatherland by their actions, tolerance. To form the skills of creative thinking and independence of judgment, interest in the domestic and world cultural and scientific heritage, its preservation and enhancement. | 4 | **v** | **v** |  |  |  |  |  |  |  |  |  | **v** |
| 5 | Socio-Ethical Development Module | GED | HSC | Ecosystem and Law | The purpose of the discipline isFormation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, research methods.Formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, research methods.Fundamentals of safe interaction between man and nature, productivity of ecosystems and the biosphere. Entrepreneurial activity in conditions of limited resources, increasing the competitiveness of business and the national economy. Regulation of relations in the field of ecology and safety of human life. Knowledge and observance of Kazakh law, obligations and guarantees of subjects, state regulation of public relations to ensure social progress. Application of scientific research methods. | 5 |  |  |  |  |  |  | **v** | **v** |  |  |  |  |
| 6 | BD | EC | AbayStudies | The purpose of the discipline is Deepening students' knowledge about the versatility of Abay's personality - moral and philosophical, cultural and axiological, historical, socio-political views and the relevance of humanistic values in modern society; formation of social, personal and civic competencies in the context of future professional activity.Students will be able to view the biography of Abay's works, his work, philosophical, aesthetic and social views; the history of the origin and development of Abae studies, the main works of Abaeic scholars; To form the skills of analytical reading of works of art, involving a vision of the problematic and the identification of the main artistic means of a particular text, instills a sense of patriotism and love for the motherland. |  | **v** |  |  |  |  |  |  |  |  |  |  |  |
| 7 | BD | EC | Mukhtar study | The purpose of the discipline is To form the skills to preserve the literary heritage of M. Auezov in world and oriental literature, with feelings of patriotism and love for the motherland.Students will be able to examine the history of the formation and development of the science of "Mukhtar Studies", the significance of an outstanding work of literature - the epic novel "The Way of Abay", as the creator of the science "Abay Studies". To demonstrate knowledge of his biography in context with his work. To form the skills of use of information about his life and work, independently research his works with an analysis of the content of works of art. To form the skills of analyzing the literary heritage of M.Auezov in world and oriental literature, with feelings of patriotism and love for the Motherland. |  | **v** |  |  |  |  |  |  |  |  |  |  |  |
| 8 | BD | EC | Actual problems and modernization of public consciousness | The purpose of the discipline is To form the skills of preserving national identity, disinterested service to the fatherland; openness of consciousness, readiness for change, openness and receptivity to the best world achievements of the cult of knowledge.Students will be able to study concepts, forms, signs, features, meaning and main directions of modernization of public consciousness; concepts of competitiveness, pragmatism, national identity, evolutionary development, new ideology. Form the skills of preserving national identity, selfless service to the father-land; openness of consciousness, read-iness for change, openness and sensitivity to the best world achievements of the cult of knowledge, evolutionary development of Kazakhstan, the best traditions and preconditions as an important condition for the success of modernization of public consciousness. | 3 | **v** |  |  |  |  |  |  |  |  |  |  |  |
| 9 | Communication andphysicaltraining | GED | CC | Kazakh (Russian) language | The purpose of the discipline is Formation of students' social and humanitarian outlook in the context of the national idea of spiritual modernization, which implies the development of the qualities of internationalism on the basis of national consciousness and cultural code.Students will be able to make the right choice of linguistic and speech means based on knowledge of a sufficient amount of vocabulary, grammar, syntax of the Russian language, pragmatic means of expressing various intentions. Demonstrate the skills of drafting everyday, socio-cultural, official-business texts in accordance with generally accepted norms and functional focus. To form the skills of participation in various spheres of communication in order to realize their own intentions and needs. | 10 | **v** |  | **v** |  |  |  |  |  |  |  |  | **v** |
| 10 | GED | CC | Foreign language | The purpose of the discipline is The acquisition by students of general cultural competencies in the field of a foreign language, necessary for the successful professional activity of specialists.Students will be able to examine the structure of the sentence of a part of speech, temporal forms of verbs, vocabulary of common (everyday and general scientific), terminological and professional content, texts of general scientific and professional content. Demonstrate knowledge of grammar and vocabulary, history and culture of the country of the foreign language being studied, the rules of speech etiquette; the ability to talk of average difficulty of a general nature in a foreign language. Have the skills of translating foreign technical texts of medium complexity without a dictionary; letters, necessary for the preparation of abstracts, annotations, abstracts, reasoned to state their own points of view. | 10 | **ѵ** | **ѵ** |  |  |  |  |  |  |  |  |  | **ѵ** |
| 11 | GED | CC | Physical training  | The purpose of the discipline is Formation of the physical culture of the individual and the ability to use various means of physical culture, sports and tourism for conservation.Students will be able to conduct active classes in athletics: running technique for short distances, long jump from the spot; sports games and ski training; cross and strength training. Demonstrate control and assessment of your physical condition, physical development and fitness; the ability to perform individually selected complexes of health-improving and therapeutic physical culture. Master the skills and techniques of insurance and self-insurance when performing physical exercises; independently set the daily load based on the physical condition of the person. | 8 | **ѵ** | **ѵ** |  |  |  |  |  |  |  |  |  | **ѵ** |
| 12 | BD | HSC | Professional Kazakh (Russian) language | The purpose of the discipline is Formation of communicative communication skills in the Kazakh language, the basic categorical-conceptual apparatus and terms of this specialty in the Kazakh language and the provision of professionally oriented language training for students in this educational program.The purpose of studying the dissilina "Professional Kazakh (Russian) language" is the formation and development of skills of communicative and professional competence in the Kazakh (Russian) language and providing professionally-oriented language training of a competent person who is able to adequately build communication in professionally significant situations. | 3 | **ѵ** | **ѵ** |  |  |  |  |  |  |  |  |  |  |
| 13 | BD | HSC | Professionally-oriented foreign language | The purpose of the discipline is Formation of students' foreign language competence in the professional, academic, socio-cultural spheres and the achievement by students of a foreign language proficiency level of at least B2.Кnow how to transmit the contents of the text read and heard, be able to annotate and abstract scientific articles, texts; compose business correspondence; Be able and possess the skills of constructive dialogue in order to achieve the greatest effectiveness of the goal. Вecompetent in the implementation of the communicative plan; reading and understanding literature for special purposes. | 3 | **ѵ** | **ѵ** |  |  |  |  |  |  |  |  |  |  |
| 14 | GED | CC | Information and communication technologies (in English)  | The purpose of the discipline is Mastering students of professional and personal competencies that will enable them to use modern information and communication technologies in various areas of professional activity.Students will be able to characterize the theory of computer programs for transferring, processing and storing data; explain the methods of collecting, storing and processing information, ways of implementing information and communication processes; demonstrate skills in the use of Internet information resources, electronic textbooks, e-Gov portal, cloud, mobile and SMART technologies for the search, storage, processing and dissemination of information. Apply digital analysis and data management tools for various activities; | 5 | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |  | v |  |
| 15 | Mathematics and Natural Science Fundamentals | BD | HSC | Higher Mathematics | The purpose of the discipline is Formation of future specialists' knowledge and ability to apply the mathematical apparatus and mathematical methods in the analysis, management of modern technical systems, mastering the methods of mathematical modeling and analysis of technical systems.Studies linear and vector algebra, analytic geometry; introduction to mathematical analysis; differential calculus of a single variable function. Studies double and triple integrals; analyzes the application of the function of several variables, ordinary differential equations, calculations of series theory. Forms the skill to solve typical mathematical problems, to select appropriate algorithms for solving problems, apply them in professional activities. | 5 | **ѵ** |  | **ѵ** |  |  |  |  |  |  |  |  |  |
| 16 | BD | EC | Physics | The purpose of the discipline is Providing fundamental physical training that allows future specialists to navigate scientific and technical information, use physical principles and laws, as well as the results of physical discoveries in those areas of technology in which they will work.Students will be able to characterize the main physical phenomena and processes of classical and modern physics, reveal its connection with applied problems;demonstrate knowledge of the basic theoretical provisions of classical mechanics, molecular physics, thermodynamics, electrostatics, electromagnetism and optics, quantum and atomic physics, as well as an understanding of the limits of their applicability.Demonstrate the skills of applying the laws of physics and methods of physical research in solving generalized problems as the basis for solving professional problems. | 4 |  |  | **ѵ** |  |  |  |  |  |  |  |  | **v** |
| 17 | BD | EC | Fundamentals of Quantum Mechanics | The purpose of the discipline is Formation of the basic concepts and concepts of quantum mechanics, deepening of knowledge in the field of quantum mechanics.Students will be able to characterize classical mechanics, which well describe systems of macroscopic scales, unable to describe all phenomena at the level of molecules, atoms, electrons and photons, adequately describe the main properties and their behavior, an accurate relativistically invariant description of the transformations of elementary particles in the framework of quantum field theory. To demonstrate skills in the basic concepts of quantum mechanics. To apply the basic equations of quantum dynamics - the Schrödinger equation, the von Neumann equation, the Lindblad equation, the Heisenberg equation and the Pauli principle. |  |  |  | **ѵ** | **ѵ** |  |  |  |  |  |  |  |  |
| 18 | BD | HSC | Modern computer methods for processing experimental data | The purpose of the discipline is Instilling skills in automating calculation processes, processing tabular and graphical dependencies, teaching experiment planning and the basic concepts of constructing empirical formulas, which are mathematical models of the object of study in the form of regression polynomials.Students will be able to define the area of probability theory and mathematical statistics in solving the simplest problems of mathematical statistics, to form probabilistic thinking and skills in constructing probabilistic and statistical models when solving typical mathematical and professional problems.Demonstrate knowledge of the applied orientation, implemented through the consideration of specific mathematical and applied analysis models. | 4 |  |  | **ѵ** | **ѵ** |  |  |  |  |  |  | **ѵ** |  |
| 19 | Fundamental chemistry | BD | EC | Chemistry of the Elements | The purpose of the discipline is The study of the electronic structure of the elements of the Periodic Table of Chemical Elements D.I. Mendeleev, their chemical and physical properties, production methods and applications.To describe the physical and chemical properties of the elements of Mendeleyev's periodic table, their distribution, the history of discovery, the main methods of obtaining, the frequency of changes in their physical and chemical properties, depending on their location in the periodic table of elements. To apply the skills of theoretical knowledge to address the synthesis of chemical compounds with desired properties. To solve tasks, work in a team when performing an experiment in laboratory classes and educational research work. | 7 |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |  |
| 20 | BD | EC | Solution Theory | The purpose of the discipline is Formation of basic concepts of the formation of solutions and colloidal systems and consideration of their basic physicochemical properties.Students will be able to consider chemical phenomena and their laws, taking into account the knowledge of the theory of solutions. Describe the concept of solvates and hydrates, the doctrine of the properties of solutions. Demonstrate skills in constructing a vapor pressure diagram. Explain the positive and negative deviations from Raoult's law. Explain and calculate the isotonic coefficient and its relationship with the degree of dissociation, the concept of dilute solutions. Demonstrate skills in methods for determining the molecular weight of a substance (ebulioscopic, cryoscopic methods). |  |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |  |
| 21 | BD | EC | Theoretical Fundamentals of Inorganic Chemistry 1 | The purpose of the discipline is Deepening students' knowledge in the field of inorganic chemistry, but also helping to master specific calculation schemes, a critical understanding of their real possibilities and limitations, to acquaint students with modern views on the theoretical foundations of inorganic chemistry.To describe the basic concepts and laws of chemistry, the theory of atomic structure and chemical bonds, energy and kinetic patterns of chemical processes, the main provisions of the theory of solutions, acids and bases, the basics of electrochemistry, the periodic law for describing the periodicity of changes in the properties of atoms. To generalize the processes in solutions, the conditions for their spontaneous course, the strength of acids and bases. Apply skills in solving any chemical problems, the simplest calculations. | 4 |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  |  |  | **ѵ** |  |
| 22 | BD | EC | General and inorganic Chemistry | The purpose of the discipline is Formation and development of the student's chemical thinking, deepening of theoretical knowledge in chemistry; acquisition of skills to use in the study of disciplines.Students will be able to demonstrate knowledge of the material world in all the diversity of its existence and transformation. To demonstrate knowledge of the composition of substances and the processes of their transformation, their structure and necessarily energy changes in the reacting environment. To explain the main provisions of atomic-molecular doctrine and the foundations of the modern theory of the structure of matter. To demonstrate the skills of applying the laws of thermodynamics to predict the possibility and direction of the course of chemical processes, to demonstrate the skills of conducting a chemical experiment in laboratory conditions, be able to correctly process and explain the results of the experiment. |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | v | **v** |  |  |  |  |
| 23 |  | BD | EC | Theoretical Fundamentals of Inorganic Chemistry 2 | The purpose of the discipline is Deepening students' knowledge in the field of inorganic chemistry, to acquaint students with modern views on the theoretical foundations of inorganic chemistry.Students will be able to demonstrate knowledge of the structure of the periodic table of elements, chemical and crystal-chemical structure of simple substances; characterize the physical and chemical properties of simple compounds, substantiate the principles of their obtaining. Demonstrate skills in the classification of binary compounds. Demonstrate knowledge of the classification of complex chemical compounds; be able to explain the properties of hydroxides, their acid-base properties, amphotericity. Master the basic techniques of analyzing the physical and chemical properties of simple and complex substances. | 8 |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  |  |  | **ѵ** |  |
| 24 | BD | EC | Classification and nomenclature of chemical compounds | The purpose of the discipline is Fundamental preparation of a student in the basic discipline in the cycle of chemical education, for the formation of a scientific and methodological approach in the creative activity of a specialist.Students will be able to demonstrate knowledge of the system of rational names of chemically individual substances by: random signs, by methods of obtaining, by the name of the discoverer. To demonstrate knowledge of modern and international nomenclature of organic and inorganic compounds, seeking to express all the information contained in chemical formulas, principles of classification of substances. To demonstrate the skills of applying rational and systematic nomenclature for the names of substances when reflecting the composition, chemical and spatial structure of the compound. |  |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |  |
| 25 | ChD | EC | Analytical chemistry | The purpose of the discipline is Formation of systemic knowledge of the basic laws of chemical processes and further development of the general chemical training of the student.Students will be able to characterize the theoretical foundations and methods of qualitative and quantitative analysis, the types of chemical reactions used. Explain the understanding of the importance of sampling and sample preparation. Ability to use methods of detection, isolation, separation and concentration in the analysis of inorganic and organic substances. Own the methods of analysis of raw materials, semi-finished products and finished products. To develop the skills of conducting analysis on modern instruments and apparatus. Demonstrate skills in statistical processing of analysis results, correctness and their reproducibility. | 5 |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |
| 26 | ChD | EC | Analytical Methods of Technical Practice | The purpose of the discipline is Formation of systemic knowledge of the basic laws of chemical processes and further development of the general chemical training of the student.Students will be able to demonstrate knowledge in the technical analysis of the conformity of raw materials, materials and finished products, in the stage-by-stage control of the production technological process. Explain the process of carrying out technical, chemical, physicochemical and physical methods of analysis: gravimetry, titrimetry, electrochemical, optical and chromatographic methods. Students will be able to demonstrate skills in performing analysis on instruments and apparatus, skills in statistical processing of analysis results, accuracy and reproducibility. |  |  |  |  | **ѵ** |  | **ѵ** |  |  |  |  | **ѵ** |  |
| 27 |  | BD | EC | Organic chemistry | The purpose of the discipline is Formation of fundamental knowledge about the theory of chemical structure, classification of organic compounds, functional groups that provide the main chemical properties, features of the mutual influence of atoms in the molecules of organic compounds;Students will be able to characterize the basic chemical properties of hydrocarbons and the theory of the structure of organic compounds, electronic effects, the main mechanisms of reactions of organic compounds. Demonstrate knowledge of the basic laws of organic chemistry in the development and implementation of synthesis, predict the properties of compounds depending on their chemical structure, electronic effects. Demonstrate skills in the synthesis and analysis of organic substances in accordance with basic natural science laws and laws. Demonstrate knowledge of chemical sciences. Form the skills of analysis and interpretation of the results of chemical experiments, observations and measurements. | 5 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 28 |  | BD | EC | Theoretical Fundamentals of Organic Chemistry | The purpose of the discipline is Assimilation of the theoretical foundations of organic chemistry and develops basic skills in determining the structure of organic molecules, assessing their reactivity, interpreting the mechanisms of organic reactions based on knowledge of the properties of intermediates.Students will be able to characterize the theory of the chemical structure of organic substances, concepts of chemical bonding, bond order, hybridization. Demonstrate knowledge of the mechanism of organic reactions, develop skills in analyzing the structure of organic substances on the basis of spectroscopic and chromatographic identification methods.Demonstrate skills in calculating the ratio of reagents and the practical yield of the reaction product.  |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 29 | BD | EC | Chemistry of Functional Derivatives of Organic Molecules | The purpose of the discipline is Formation of students' systemic basic knowledge about the basics of organic chemistry. Organic chemistry is one of the fundamental disciplines in the preparation of a bachelor.Students will be able to characterize the specific properties of functional derivatives in a series of monofunctional, bifunctional and polyfunctional derivatives; to compare methods of obtaining organic substances, their physical and chemical properties. Interpret the main reaction mechanisms for each class of derivatives; analyze the features of the electronic structure, isomerism, tautomerism of organic molecules. Demonstrate the skills of solving certain problems using the knowledge gained, generalize the laws of the properties and structure of organic compounds. | 6 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 30 | BD | EC | Theoretical Fundamentals of the Synthesis of Functional Polymers | The purpose of the discipline is Formation of students' knowledge and skills, allowing them to apply the main theoretical provisions of the compulsory medical insurance course, familiarize students with the basics of polymer science and its important practical applications.Students will be able to demonstrate the main features of polymer compounds, their practical value as a special kind of materials and their biological significance. Analyze the features of the polymer state; interpret and distinguish between polymerization and polycondensation reactions, the direction of the reactions.Demonstrate practical skills in the field of polymer synthesis, modern methods of polymer research, principles of technology for the production and processing of polymer materials. |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 31 | BD | EC | Physical chemistry | The purpose of the discipline is Fundamental preparation of a student in the basic discipline in the chemical educational cycle for the formation of a scientific and methodological approach.Students will be able to consider chemical phenomena and their laws, taking into account the laws of thermodynamics. Describe the concept of heat, internal energy, the doctrine of the properties of solutions, Raoult's law. Explain the concepts of the activation energy of reactions, the theory of electrolytic dissociation, phase equilibria, chemical kinetics and catalysis. Demonstrate skills in constructing cooling curves, determining the composition of the metal-metal system, eutectic points. Explain the concepts of liquidus and solidus, reversible, irreversible processes. Demonstrate skills in physical and chemical research methods (IR spectra, NMR spectra, derivatography), solving typical problems. | 6 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 32 | BD | EC | Colloidal chemistry | The purpose of the discipline is Formation of basic knowledge about fundamental laws, patterns and basic physical and chemical methods, which will allow students to systematize theoretical knowledge in chemistry.Students will be able to consider dispersed, colloidal, emulsion systems, the factors of their stability and stabilization; the concept of high molecular weight substances (HMW). To characterize the electrokinetic, optical, molecular-kinetic properties of dispersed systems. Explain surface phenomena: the concept of surfactants, the orientation of molecules in the surface layer, adsorption on a solid-liquid and liquid-liquid surface. Demonstrate skills in calculating flow potential, sedimentation, diffusion, skills in analyzing experimental data. |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 33 | Nanochemistry and Modern Methods of Analysis  | ChD | EC | Nanochemistry and Nanotechnology | The purpose of the discipline is Formation of research and teaching activities related to solving the problems facing modern civilization when conducting research in the field of nanochemistry and nanotechnology.Students will be able to characterize the objects of nanochemistry - carbon nanotubes, nanoparticles, fullerenes, study their properties, structure and features of chemical transformations of nanoparticles. To characterize the optical, molecular-kinetic properties of nanoparticles. To explain practical methods for studying nanostructures: characterize nanomaterials, the orientation of molecules and atoms in the preparation of nanomaterials. Demonstrate the skills of calculating objects and materials at the nanometer scale to create new materials and systems. | 5 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 34 | ChD | EC | Chemical Kineticsand Catalysis | The purpose of the discipline is Study of modern theories and methods of chemical kinetics and catalysis, theoretical principles for constructing kinetic models of various physical and chemical processes, regulation of activity and selectivity of reactions by varying the conditions of the process.Students will be able to consider chemical phenomena and their laws, taking into account the laws of chemical kinetics and catalysis, characterize the concept of the rate of a chemical reaction and explain the factors that affect the rate of a chemical reaction: concentration, temperature, the nature of the solvent. To demonstrate skills in calculating average and true reaction rates. To be able to explain and calculate the molecularity and order of the reaction, the rate constants of the process, explain the Van't Hoff rule when calculating the reaction rate. To demonstrate skills in the experimental determination of the kinetics of various chemical processes, the ability to solve typical tasks in homogeneous and heterogeneous catalysis. |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |
| 35 | ChD | EC | Modern Physico-Chemical Methods of Analysis | The purpose of the discipline is Mastering by students the theoretical and methodological foundations of modern physical and chemical methods for the study of substances. Formation of skills for independent analytical research using physical and chemical analysis.Students will be able to characterize modern physico-chemical and electronic methods of analysis based on the study of the interaction of fields, radiation or particle fluxes under certain conditions, with the experimental implementation and practice of applying these methods. Demonstrate knowledge of general characterization and classification of methods of analysis. Explain the direct and inverse problems of spectroscopic and diffraction methods. Demonstrate skills and abilities in performing spectroscopic, electronic and atomic adsorption analysis for the identification of substances. | 6 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 36 | ChD | EC | Theoretical and Applied Aspects of Hydrochemistry | The purpose of the discipline is Formation of scientific knowledge about the chemical properties of natural waters, ideas about hydrochemical processes and phenomena in water bodies, development of practical skills for chemical analysis of water and the ability to interpret, analyze and generalize hydrochemical information.Students will be able to characterize the general concepts and definitions of the chemistry of water and aqueous solutions, the formation of the chemical composition of natural waters in general, know the types of classification of surface and ground waters by chemical composition and spatio-temporal changes in their chemical composition in relation to physical, chemical and biological processes in hydrosphere. Demonstrate skills in waste and natural water analysis. |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 37 |  | ChD | HSC | Industrial practice ІІ | The aim of the discipline:Obtaining professional skills and experience of professional activity is the consolidation and deepening of the theoretical training of the student, the acquisition of practical skills and competencies for the implementation of future professional activities in the field of education.Students will be able to characterize the features of the production technology, the characteristics of raw materials, the main and auxiliary technological equipment, the norms of the technological mode of production; requirements for the quality of products;ecological problems; Demonstrate knowledge and skills in formalizing the results of the research carried out in the form of an expert opinion in the course of technical and forensic studies of the object. Demonstrate skillsinworking withmodern electronicdevices. | 6 |  | **ѵ** |  | **ѵ** |  | **ѵ** |  |  | **ѵ** |  |  |  |
| 38 | Basics of Specialty | BD | EC | Introduction to Specialty | The purpose of the discipline is Formation in students of a holistic view of the world and the role of chemistry in creating a modern natural-science picture of the world; the ability to explain the objects and processes of the surrounding reality: the natural, social, cultural, technical environment, using chemical knowledge for this;To understand the peculiarities of the credit system of education at the university according to the selected educational program in the aggregate of the studied disciplines and their interrelation. To understand the basic physical and chemical properties of inorganic compounds, their behavior in chemical reactions. To assess their practical importance for the development and modernization of the chemical industry. | 4 | v |  |  |  | **ѵ** |  |  | **v** |  |  |  |  |
| 39 | BD | EC | Fundamentals of Acadimic Writing  | The purpose of the discipline is The formation of professional competence and the expansion of communicative competence associated with analytical textual activity, the formation of students' skills of linguistic and pragmatic thinking, the ability to analyze expressive units of the language and competently select the desired unit depending on the goals and conditions of communication.Students will be able to consider communicative competencies in the use of the state, Russian and foreign languages in relation to the academic field. To form the skills of pragmatic thinking on the materials of the state, Russian and foreign languages, to be able to analyze variant units of the language and competently select the desired unit depending on the goals and conditions of communication. |  | **ѵ** |  |  |  |  |  |  |  |  |  |  |  |
| 40 | BD | EC | Educational Practice | The purpose of theof educational practice:Consolidation of theoretical knowledge gained in the study of general professional and special disciplines, and obtaining practical skills. The basis for the effectiveness of the practice is the independent and individual work of students.Students will be able to use knowledge of fundamental disciplines in their professional activities; study the educational program of the specialty, types, functions and tasks of future professional activity. To characterize the cognitive activity associated with the conscious choice of the trajectory of individual learning. To form knowledge on the characteristic features of industrial enterprises in various industries. To develop skills in working with computer programs for creating text and graphic documentation, applied calculations, etc. | 2 | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |  | **ѵ** |
| 41 | Electrochemistry and Structure of Matter | BD | EC | Fundamentals of Modern Applied Electrochemistry | The purpose of the discipline is Formation of knowledge of the basics of design and operation of electrochemical systems; measurement methods in electrochemistry; studying the theoretical foundations of applied electrochemistry.Students will be able to demonstrate knowledge of the most important laws used in applied electrochemistry, characterize the development trends of electrochemical production, accumulation, direct conversion of chemical energy into electrical energy in fuel cells; interpret the problems of combating corrosion by electrochemical methods, apply the basic electrochemical laws in the electrodeposition of metals and alloys; to form practical skills when conducting an experiment. Demonstrate the ability to work in a team when performing experiments and processing the results | 6 |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |
| 42 | BD | EC | Fundamentals of Material Science | The purpose of the discipline is To equip graduates with knowledge of the nature and properties of materials, ways of strengthening them, the influence of technological methods for obtaining blanks on the quality of parts, as well as skills that made it possible to reasonably select materials during design.Students will be able to characterize the basics of structure and properties of materials and their phase transformations. To analyze the patterns of crystallization and structure formation of metals and alloys, the basics of their heat treatment, methods of protecting metals from corrosion; to demonstrate knowledge of recognizing and classifying structural and raw materials by origin, properties. To demonstrate the ability to identify types of structural materials for their purpose and operating conditions. Demonstrate the ability to conduct research on material properties |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |
| 43 | BD | EC | Structure of Matter | The purpose of the discipline is Assimilation by students of the basic provisions of the electronic structure of atoms and molecules, the ability to use various types of spectroscopy to determine the nature and transformations of molecular systems.Students will be able to characterize the structure of atoms, molecules, crystals and the nature of chemical bonds, the relative arrangement of atoms in space, their geometry, the influence of internal energy on the structure of molecules. To explain the theory of valence schemes and MO for calculating chemical bonds in specific substances. To demonstrate knowledge of spectroscopic methods in the study of various chemical models of matter. To demonstrate skills in studying the structure of matter, be able to explain some of the parameters of molecules. To form the skills of calculating molecular orbitals, their energy and other parameters. | 4 |  |  |  |  | **ѵ** | **ѵ** |  | **v** | v |  |  |  |
| 44 | BD | EC | Fundamentals of Quantum Chemistry | The purpose of the discipline is Mastering the skills of students to assess the adequacy of the application of quantum chemistry methods for the interpretation and prediction of experimental data, including spectral, structural, chemical-kinetic and thermodynamic.Students will be able to characterize the structure and properties of chemical compounds, reactivity, kinetics and the mechanism of chemical reactions based on quantum mechanics. To explain the quantum theory of molecular structure, chemical bonds and intermolecular interactions. To demonstrate knowledge of the quantum theory of chemical reactions and reactivity. To demonstrate skills in applying the chemical and physical properties of substances at the atomic level. To develop skills for finding solutions to equations describing processes in chemical systems, to be able to apply approximate calculation methods. |  |  |  |  | **v** |  |  | **ѵ** | **ѵ** |  |  |  |  |
| 45 | Applied Chemistry  | BD | EC | Theoretical Fundamentals of Modern Chemistry | The purpose of the discipline is Formation in students of a holistic view of the processes and phenomena in nature and technology, understanding the possibilities of modern scientific methods of understanding the material world and mastering these methods for solving problems.Students will be able to characterize knowledge of the theoretical fundamentals of the structure of matter and the processes of its transformation, accompanied by a change in the composition and structure, the nature of the chemical bond in the original molecules. To explain the quantum-chemical representations of the aggregate state of matter - liquid, solid, gaseous. To demonstrate the acquired skills while obtaining new materials: superconductors, semiconductors, nanomaterials. To form the skills of full-fledged knowledge of the basics of modern chemistry, from the standpoint of atomic-molecular teaching. To demonstrateskillsinimprovingchemicalprocessmanagement. | 6 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 46 | BD | EC | Chemistry of Coordination Compounds | The purpose of the discipline is The study of representatives of individual classes of coordination compounds, their nomenclature, parameters of chemical bonding in molecules, their geometric configuration, types of isomerism, familiarization with the main physicochemical methods for studying the structure and properties of coordination compounds, methods for their synthesis, purification and identification.Students will be able to demonstrate theoretical knowledge about the nature of chemical bonds in complex compounds, their kinetic and thermodynamic properties, about their behavior in aqueous and non-aqueous solutions; as well as the readiness to apply the concepts of the chemistry of coordination compounds in the description of various physicochemical systems (catalysis, analytical chemistry, ecological systems, physical chemistry of solutions, biochemistry, etc.) |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 47 | ChD | HSC | Industrial practice l | The purpose of the discipline is Obtaining professional skills and experience in professional activities, consolidating and deepening the theoretical training of the student, acquiring practical skills and competencies for future professional activities in the field of education.Students will be able to deepen their theoretical knowledge of inorganic and organic chemistry, physics and other disciplines, knowledge of physical and chemical methods of analysis in specialized industry laboratories, the main shops of regional branch industries, operational forensic departments, organizations of the Department of Environmental Protection. Demonstrate knowledge of the technology of production of various chemical compounds, synthetic detergents and other products. Get acquainted with the basics of chemical quality control of raw materials and products. | 4 |  |  |  | **ѵ** |  | **ѵ** |  | **ѵ** |  |  |  | **ѵ** |
| 48 | ChD | EC | Chemistry of High-Molecular Compounds | The purpose of the discipline is Formation of ideas about the features of the polymeric state of a substance, about the relationship between the structure of polymer molecules and the properties of materials based on them. To form the student's theoretical ideas about the chemical composition, structure and properties of representatives of the main classes of polymers.Students will be able to characterize knowledge about the basic chemical properties of polymers, the main types of polymeric materials, structural features of high-molecular compounds, areas of practical application and reactions of their synthesis. To demonstrate knowledge of their practical value as a special kind of materials. To form practical skills for solving applied tasks in the technology of production and processing of polymeric materials, skills in analyzing and interpreting the results of the synthesis of high-molecular compounds. | 5 |  |  |  | **ѵ** |  | **ѵ** |  |  | **ѵ** | **ѵ** |  |  |
| 49 | ChD | EC | Structure and Reactivity of Organic Compounds | The purpose of the discipline is Acquisition of professional knowledge in the field of theoretical organic chemistry, preparation for understanding the mechanisms of organic reactions and methods for their detailed study.Students will be able to characterize the main regularities of the reactivity of organic compounds, the mechanism of flow, the relationship between the structure, properties and reactivity of organic substances. To demonstrate knowledge on the classification of reaction mechanisms and skills in predicting the reactivity of organic molecules according to classical structural models. To form the skills in analyzing the main physical methods for determining the structure: IR, UV and NMR spectroscopy. |  |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** | **ѵ** |  |  |
| 50 |  | BD | EC | Chemical Ecology | The purpose of the discipline is The study of chemical processes that determine the state and properties of the environment - the atmosphere, hydrosphere, lithosphere. familiarize with the chemical foundations of biogeochemicalStudents will be able to characterize the variety of chemical, biological processes in the environment, the circulation of substances and their impact on human life, chemical, biological methods and means of protecting the environment. To explain the natural and forced processes of transformation, accumulation and transport of substances in the biosphere; knowledge of their anthropogenic impact on the environment. To demonstrate skills in determining the ecological situation of a local and global nature; environmental monitoring and methods of its protection. To show teamwork skills when performing an experiment and processing results | 5 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 51 |  | BD | EC | Radiation Chemistry | The purpose of the discipline is Assimilation by students of the basic provisions of radiation chemistry, obtaining ideas about radiation-chemical processes occurring under the influence of ionizing radiation, linear energy transfer, sources of high-energy particles, types of various isotopes used in scientific research.Students will be able to understand the processes, occurring in the irradiated environment under the influence of ionizing and electromagnetic radiation on a substance. To demonstrate knowledge of ionizing radiation for the implementation of useful chemical processes, to have the concept of ionization potential. To demonstrate knowledge of radiation-chemical technology for the economic implementation of radiation-chemical reactions. To develop skills in practically realizable chain reactions - polymerization and synthesis of low molecular weight compounds, stages of the irradiation process with the formation of ions, atoms, radicals. |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 52 | Scientific Research and Management | BD | EC | Planning and Setting up SRW | Course objective:Consolidation and deepening of theoretical knowledge obtained by students in the learning process. Improvement and search for new forms of integration of the higher education system with science and production activities within the framework of a single system of the educational process. Identification of capable young people for further postgraduate studies, work at the department and in scientific laboratories, who have shown a penchant for technology, creativity and science.Students will be able to organize and conduct research work; to determine its efficiency, the area of using various methods of physical and chemical research - calorimetric, X-ray phase, IR spectrometric, DTA method. To develop skills in conducting thermodynamic modeling of kinetic and applied research in various areas of industry. | 5 |  | **ѵ** |  |  | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |  |  |
| 53 | BD | EC | Fundamentals of Research and Patent Law | The purpose of the discipline is Students gaining knowledge about the basics of scientific creativity and the formation of scientific research planning skills from choosing a topic to public presentation of the results. To form students' understanding of the requirements for the organization of scientific research.Students will be able to characterize the basic principles of experimental research, the basics of classification, physical and mathematical modeling, methods of scientific experiment based on the basic laws of natural science; experimental and statistical methods for processing experimental data and analyzing the physicochemical features of technological processes. To develop skills in solving problems of optimization of technological parameters in various industries. |  |  | **v** |  | **v** |  |  | **ѵ** |  |  |  | v |  |
| 54 | ChD | EC | Innovative Entrepreneurship (by industry) | The aim of the discipline:Formation of modern trends and varieties of economic development among students, problems of social conversion of the economy and management of this process, principles and methods of creating new innovative enterprises and organizations.Students will be able to characterize the resources of industrial enterprises: fixed, circulating capital, labor resources, their characteristics.Explain the mechanism of functioning of enterprises in market conditions. An idea is being formed about engineering economically oriented activities to ensure the competitiveness of products and production. Skills are developed in assessing the effectiveness of the enterprise.Demonstrateandimproveskillsinmanagementdecisions. | 4 |  |  | **ѵ** |  |  |  |  | **ѵ** |  | **ѵ** | **ѵ** |  |
| 55 | ChD | EC | Organization of Production and Management | The purpose of the discipline is To teach students the theoretical foundations of the organization of production, to form the scientific and applied apparatus of the discipline, its main categories, methodological features and basic principles, conditions for increasing the efficiency of the organization of production, taking into account the factors of the external and internal environment.Students will be able to demonstrate knowledge of the content and distinctive features of the organization of technological production and management in a market economy. Organize production and management in the intensification of chemical, petrochemical and other industries, the basics of marketing activities in the market. Be able to analyze marketing situations. Develop skills in planning and analyzing marketing activities. |  |  |  | **ѵ** |  |  |  |  |  |  |  | **ѵ** |  |
| 56 | Сhemistry of Biological Compounds | BD | EC | Biochemistry  | The purpose of the discipline is Acquisition of knowledge about the structure and properties of chemical compounds that make up living organisms, about the basic laws of biochemical processes and mechanisms for regulating metabolism.Students will be able to characterize general concepts and ideas about biochemical substances that affect the structure and composition of the body - proteins, enzymes, carbohydrates, lipids, vitamins, nucleic acids. To characterize their biochemistry and the structure of their organization, properties and physiological functions. To analyze the synthesis of proteins, nucleic acids, carbohydrates, fats and metabolic effects in the body. To demonstrate skills in biochemical synthesis and processing of results. | 5 |  |  |  | **ѵ** | **v** | **ѵ** | **ѵ** | **v** |  |  |  |  |
| 57 | BD | EC | Introduction to Biopolymer Chemistry | The purpose of the discipline is Gaining knowledge about the properties of biopolymers and the application of chemical methods to study the structure and functions of these biopolymers, the formation of chemical knowledge about biopolymers as a class of macromolecular compounds.Students will be able to characterize high-molecular natural compounds that are the structure of all living organisms and play a decisive role in the process of their life: proteins, polysaccharides, nucleic acids. To demonstrate knowledge of protein denaturation, conformation of the spatial form of protein molecules, skills in the study of the structure and conformational transformations of proteins and polysaccharides. To demonstrate skills in detecting DNA and RNA of polynucleides |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** |  |  | v |  |  |
| 58 | ChD | EC | Chemistry of biological active substances | The purpose of the discipline is Formation in students of a system of knowledge about the structure, molecular mechanisms of action and practical application of biologically active compounds of various groups, students gaining theoretical knowledge and practical skills in the field of chemistry of biologically active substances.Students can describe the chemical structure and biological activity of the main groups of biologically active substances, their classification, physiological functions. Reveal the relationship between their chemical structure and biological activity. To generalize the regularities of the chemical behavior of biomolecules, secondary metabolic products and their modified derivatives. Demonstrate knowledge of the behavior of biomolecules in living organisms, their classification, structure and physiological functions. Apply skills in organizing and conducting a chemical experiment, processing experimental data, and work in a team. | 6 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  | **ѵ** |
| 59 | ChD | EC | Chemistry of Psychotropic and Medicine Products | The purpose of the discipline is Formation of knowledge about the basic principles of creating new synthetic drugs, assimilation of the relationship between the structure of drugs and their biological activity with the aim of subsequent application of the information received for the synthesis of new biologically active compounds of directed action.Students will be able to characterize the classification of psychotropic and medicinal products for pharmacological research and clinical observation; to explain their main qualitative indicatorssuch as organotropy and parasitotropy. To demonstrate the skills in conducting chemical qualitative and quantitative analysis of drugs; to demonstrate the skills in organizing, planning and conducting laboratory work to obtain drugs using modern apparatus for their synthesis. |  |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |
| 60 | ChD | EC | Quality Control of Polymer Materials | The purpose of the discipline is Formation of the ability to understand the physical and chemical essence of the processes of obtaining PCM and use the basic theoretical laws in complex production and technological activities.Students will be able to describe the composition and types of polymeric materials, with the formation of representations about the structure of polymers. Demonstrate knowledge of the properties and composition of materials, allowing to describe the technology of their production. Form the skills underlying chemical structures, describing the basic properties of polymeric materials. Demonstrate knowledge of determining the type of polymer, by the nature of behavior. Apply polymer identification skills based on measuring their mechanical and chemical properties. | 5 |  |  |  |  | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |  | v |
| 61 | ChD | EC | Chemistry of Natural Compounds | The purpose of the discipline is Familiarization of students with a number of sections of bioorganic and bioinorganic chemistry devoted to the study of the properties of a number of physiologically important natural compounds. Formation of students' knowledge in the field of molecular foundations of the functioning of these compounds in living organisms.Students will be able to describe the natural compounds that make up living organisms, the natural ways of their transformation and methods of artificial production. Demonstrate knowledge of the complex composition and structure of natural compounds, classification of reaction mechanisms and skills in predicting the reactivity of natural compounds, their classical structure. Apply methods for studying the chemical properties of natural compounds. |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |
| 62 | Chemical technology | BD | EC | General Chemical Technology  | The purpose of the discipline is Formation of students' skills for solving technology problems in relation to industrial production, calculating elements of chemical equipment and using the results in professional activities.Students will be able to systematize their knowledge of the theoretical basics of chemical technology, to explain the physical basis of the basic laws of homogeneous and heterogeneous processes, the features of catalytic processes. To analyze and explain the factors, limiting the rate of chemical technological processes. To demonstrate skills in applying the main methods of chemical technology: synthesis and analysis of chemical technological systems; calculation of material and heat balances of chemical technological processes. | 5 |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |  |  |
| 63 | BD | EC | Basic Technological Processes of Chemical Productions  | The purpose of the discipline is Familiarization with the general laws of chemical technology, the most typical chemical-technological processes, reactors and chemical-technological systems (CTS), as well as the basics of chemical technology for a number of industries and water treatment.Students will be able to formulate general principles for the development of the main technological processes of chemical production based on a systematic approach. To demonstrate knowledge of methods of organizing chemical-technological processes. To classify basic information about chemical raw materials, water, energy and energy sources. To demonstrate the skills of organizing the chemical-technological process, to explain and analyze the technologies for the production of the most important chemical products of organic and inorganic synthesis. |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |  |  |
| 64 | ChD | EC | Chemistry of detergents | The purpose of the discipline is To form among students the basic concepts of chemical production, familiarity with the theoretical foundations of the chemistry of detergents, chemical technology, the main components of chemical and technological processes, consideration of production technologies for the most important synthetic detergents.Students will be able to characterize information about the chemical composition, properties and purpose of the components of synthetic detergents (CMC); surfactants, electrolytes, complexing agents, enzymes, optical brighteners, flavors. To analyze the main provisions of the theory of detergent action, technology for the production of powdery, pasty, liquid and lumpy SMS. To form the skills of drawing up the formulation of synthetic detergents and obtaining them in laboratory conditions. | 6 |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** | **ѵ** |  | **ѵ** |
| 65 | ChD | EC | Analytical Control of Product Quality | The purpose of the discipline is To form students' understanding of the forms and methods of analytical control at industrial enterprises and laboratories, to get an idea of the features of the analysis of various objects, to master the methodology for choosing analysis methods, to gain skills in their application.Students will be able to demonstrate knowledge of the chemical composition or chemical properties of samples of liquids, gases, vapors and solids and methods of analysis, research methods for all kinds of chemical elements and compounds. To conduct analytical quality control of raw materials and finished products in various industries, to conduct all kinds of scientific experiments, to identify the degree of environmental pollution. To develop skills and experience in working with modern instrumental analysis methods, used for the analysis of chemical compounds and food products. |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  |  |  |  |  |
| 66 | Module for acquiring new professional competencies | BD | EC | Subjects on the Additional Educational Program | Minutes No. 563 dated October 31, 2018 Additional educational program (Minor) (minor) - a set of disciplines and (or) modules and other types of educational work, determined by the student for study in order to form additional competencies. | 12 |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** |  |  |  |
| 67 | Finalcertificationmodule | ChD | HSC | Pre-degree or industrial practice | Knowledge of production technology, characteristics of raw materials and products is deepening; technological regime standards, consumption of raw materials and materials. Formation of production skills for independent work, data collection for the performance of graduate qualification work, initial data for research work, technical and forensic studies of documents. Demonstrate knowledge of describing the structure of an expert opinion Demonstrate skills in generalization, analysis, correction of the collected material necessary in the future when completing a thesis or project. | 8 |  |  | **ѵ** |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** | **ѵ** |
| 68 |  | ChD | HSC | Writing and defending a thesis, graduation project or preparation and passing of a comprehensive exam | Practical skills in conducting an analytical review and patent search; independent choice of ways to improve technological processes in order to ensure high quality of manufactured products; technical and forensic research are formed. Demonstrate skills in structure, content, formation and execution of expert opinions. Technical and economic assessment of the effectiveness and feasibility of work (project), presentation and protection of work (project). | 12 |  |  | **ѵ** |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** | **ѵ** |  | **ѵ** | **ѵ** |

**5. SUMMARY TABLE SHOWING THE VOLUME OF DISPUTED LOANS BY EP MODULES**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CourseofStudy | Sеmеstr | Numberofmasteredmodules | Numberofdisciplinesstudied | Amount of credits KZ | Totalinhours | Total creditsKZ | Amount |
| OC | HSC | EС | Theoreticalteaching | Physicaltraining | Studypractice | Industrial practice | Finalattestation | Exam | Gradedpass |
| 1 | 1 | 5 | 5 | 1 | 1 | 28 | 2 | - | - |  | 900 | 30 | 6 | 1 |
| 2 | 5 | 4 | 1 | 3 | 26 | 2 | 2 | - |  | 900 | 30 | 5 | 3 |
| 2 | 3 | 5 | 3 | 2 | 2 | 28 | 2 | - | - |  | 900 | 30 | 6 | 1 |
| 4 | 4 | 1 | 1 | 4 | 24 | 2 | - | 4 |  | 900 | 30 | 4 | 2 |
| 3 | 5 | 5 | - | 1 | 5 | 30 |  | - |  |  | 900 | 30 | 6 |  |
| 6 | 3 | - | 1 | 3 | 24 |  | - | 6 |  | 900 | 30 | 3 | 1 |
| 4 | 7 | 3 | - | - | 4 | 20 |  | - | - |  | 600 | 20 | 4 | - |
| 8 | 2 | - | - | 4 | 20 |  | - | - |  | 600 | 20 | 4 | - |
|  | 9 | 2 |  |  |  |  |  | - | 8 | 12 | 600 | 20 |  | 1 |
| Total  | 34 | 8 | 7 | 26 | 200 | 8 | 2 | 18 | 12 | 7200 | 240 | 38 | 9 |

**6 STRATEGIES AND METHODS OF TRAINING, MONITORING AND EVALUATION**

|  |  |
| --- | --- |
| **Learning Strategies** | **Student-centered learning:** the learner is the center of teaching/learning and an active participant in the learning and decision-making process.**Practice-oriented learning:** focus on the development of practical skills. |
| **Teachingmethods** | Conducting lectures, seminars, various types of practices:• application of innovative technologies:• problem learning;• case study;• work in a group and creative groups;• discussions and dialogues, intellectual games, competitions, quizzes;• methods of reflection, • presentations;* rational and creativeuseofinformationsources:
* multimediaeducationalprograms;
* electronic textbooks;
* digital resources.
* Organization of independent work of students, individual consultations.
 |
| **Monitoring and assessing the achievability of learning outcomes** | **Current control** on each topic of the discipline, control of knowledge in classroom and extracurricular activities (*according to the syllabus*). Assessment Forms:* survey in the classroom;
* testing on the topics of the academic discipline;
* test papers;
* • discussions;
* • trainings;
* • colloquia;
* • essays, etc.

**Midterm control** at least two times during one academic period within the same academic discipline.**Intermediate certification** is carried out in accordance with the working curriculum, academic calendar.Conduct forms:* exam in the form of testing;
* oral exam;
* a written exam;
* combined exam;
* protection of practice reports.

**Final statecertification.** |

**7. EDUCATIONAL AND RESOURCE SUPPORT OF THE EP**

|  |  |
| --- | --- |
| **Information Resource Center** | The structure of the EIC includes 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The basis of the network infrastructure of the EIC is 180 computers with Internet access, 110 workstations, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 scanners of A-4 format and 3. The software of the EIC is AIBS "IRBIS-64" under MS Windows ( basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system.The library fund is reflected in the electronic catalog available to users on the site http://lib.ukgu.kz on-line 24 hours 7 days a week.Thematic databases of their own generation have been created: "Almamater", "Proceedings of SKSU scientists", "Electronic archive". Online access from any device in 24/7 mode via the external link http://articles.ukgu.kz/ru/pps.Working with catalogs in electronic form. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKSU in Print", "Readers" "SKU".The JIC provides its users with 3 options for accessing its own electronic information resources: from the “Electronic Catalog” terminals in the catalog hall and in the EIC subdivisions; through the information network of the university for faculties and departments; remotely on the library website http://lib.ukgu.kz/.Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet" , Digital library "Aknurpress", "Smart-kіtаp", "Kitаp.кz", etc.For people with special needs and disabilities, the library website has been adapted to the work of visually impaired users. |
| **Materialandtechnicalbase** | * - laboratories for inorganic, analytical, organic chemistry, for processes and apparatuses of chemical technology, auditorium (including research);
* laboratory for physical chemistry named after Muldakhmetov Z.M., for colloid chemistry named after Satayev I.K.;
* - scientific laboratory for processes and apparatuses of chemical technology named after Omarkulov P.K.;

- computer classes, classrooms with an interactive whiteboard for lectures.- spec. physics classroomStudents use the services of public laboratories of RRLIP "CBM" and SAPA to perform chemical and physico-chemical analysis. |

**AGREEMENT SHEET**

according to the Educational program

6B05320 – «Chemistry»

Director of DAQ\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Naukenova A.S.

Director of DAS \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Nazarbek U.B.

Director ofDNP and K\_\_\_\_\_\_\_\_\_\_\_\_\_ Bazhirov T.C.