# CATALOG OF ELECTIVE DISCIPLINES

7M01 - Pedagogical sciences
(Code and classification of the field of education)

7M015 - Teacher training in natural science subjects
(Code and classification of the direction of training)

0114
(Code in the International Standard Classification of Education)

M013 - Preparation of teachers of chemistry (kazakh, russian, english language)
(Code and classification of the educational program group)

7M01504 - Chemistry
(Code and name of the educational program)

Master
(Level of preparation)

set of 2023

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## Developed
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Chairman of the Academic Council Oralkanova I.A.

## Methods of evaluation and self-esteem of students in the learning process

| | |
|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*Diagnostics in the pedagogical process. Control, evaluation of knowledge, skills of trainees as necessary components of diagnosing. The most important principles for diagnosing and monitoring the learning (progress) of students (objectivity, systematic, visibility (publicity)). A variety of qualitative and quantitative criteria in pedagogy. Methodology for the development of students` evaluative independence. The role and place of self- esteem in the personal development of students. Criteria assessment methods aimed at developing self-esteem. Formative and summative assessment.*

### Purpose of studying of the discipline
*To study the most important principles of diagnosing and monitoring the learning (progress) of students (objectivity, systematic, visibility (publicity)).A variety of qualitative and quantitative criteria in pedagogy.*

### Learning Outcomes
*ON7 To design a system of evaluation criteria for various educational technologies used in educational institutions.*
*ON8 To solve problems arising in the course of research activities and requiring in-depth professional knowledge; choose the necessary research methods, modify existing and develop new methods based on the objectives of a particular study; methodology of natural science, socio-humanitarian and technical knowledge.*

### Learning outcomes by discipline
- *Consider a variety of qualitative and quantitative criteria in pedagogy;*
- *Explain the role and place of self-esteem in the personal development of students;*
- *Analyze criteria-based assessment methods aimed at developing students` self-assessment.*

### Prerequisites
### Postrequisites

## Modern interactive methods of teaching in a secondary school

| | |
|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This discipline provides for the study of the legislative and regulatory framework for the organization of education at the university, new educational technologies used in the training of a specialist; systems of chemical knowledge in non- chemical specialties. The development of discipline is a basis for the formation of special professional competence of future teachers in the field of teaching methods.*

### Purpose of studying of the discipline
*To study modern interactive teaching methods used in the training of a specialist.*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline
- *Compare the legislative and non-commercial foundations of the organization of training at a university and at school.*
- *Formulate special professional competencies of future teachers in the field of teaching students to solve chemical problems.*
- *Explain the essence of modern interactive teaching methods used in the teaching of chemistry.*

### Prerequisites
*Bachelor*

### Postrequisites
*Research practice*

## Management of research activities in organizations of secondary education

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|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*The subject involves the study of methods and functions of research management in secondary education. The significance of the school as a pedagogical system and an object of management, the conceptual apparatus of management and pedagogical management is explained. Mastering this discipline forms the skills of undergraduates to work with regulatory documents in the field of education management.*

### Purpose of studying of the discipline
*Consideration of issues related to the creation of an effective system of education management, ensuring the formation of a person who consciously understands the social and personal significance of professional activity, responsible for its results.*

### Learning Outcomes
*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of*

*effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *to identify the basic principles of management in the personnel of educational institutions;*
- *draw conclusions on the issues of advanced training and certification of school employees;*
- *to discuss the organization of the main types of creative activity of students, the organization of educational and creative activities of the teacher;*

### Prerequisites

*Bachelor*

### Postrequisites

*Research practice*

## Criteria-based assessment of students` achievements

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|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline is devoted to the study of the analysis of educational achievements of students on the basis of short-term goals and learning outcomes in accordance with the curriculum. Considers issues related to the motivation of students to fill gaps in the study of the curriculum. In the course of studying the discipline, undergraduates develop skills in developing criteria for students` educational achievements, assessing the types of educational activities.*

### Purpose of studying of the discipline

*To study, on the basis of existing scientific achievements, the Kazakhstani system of criteria-based assessment of learning outcomes to improve the quality of school education in general and the level of educational achievements of each student.*

### Learning Outcomes

*ON7 To design a system of evaluation criteria for various educational technologies used in educational institutions.*
*ON8 To solve problems arising in the course of research activities and requiring in-depth professional knowledge; choose the necessary research methods, modify existing and develop new methods based on the objectives of a particular study; methodology of natural science, socio-humanitarian and technical knowledge.*

### Learning outcomes by discipline

- *reveal the scientific foundations of criteria-based assessment technology;*
- *design criteria that evaluate subject and meta-subject results;*
- *carry out diagnostics of educational achievements of students, taking into account individual characteristics*

### Prerequisites

*Bachelor*

### Postrequisites

*Research practice*

## Methodology and modern technologies of teaching General and inorganic chemistry

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|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline provides for the study of the methodological foundations of teaching general and inorganic chemistry, the methodology for the formation of goals of teaching inorganic chemistry, modern methods for teaching chemistry. When studying the course, students develop systemic knowledge about the structural-logical connection and sequence of the content of educational material, about the classification of chemical sciences.*

### Purpose of studying of the discipline

*To acquire knowledge in the field of methodology of general and inorganic chemistry at the level of the current state of science.*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Describe the methodological foundations of teaching general and inorganic chemistry.*
- *Explain the structural-logical connection and sequence of the content of the educational material.*
- *Formulate the logic and methodology of scientific knowledge in chemistry.*

### Prerequisites

*Bachelor*

### Postrequisites

*Research practice*

## The modular technology of training of chemical disciplines in the university

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|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |

| | |
|---|---|
| Knowledge control form | Examination |

### Short description of discipline
*This course considers the study of general concepts of the technology of modular learning, the concepts of advanced study of theoretical material in modular blocks. When studying the course, students develop systemic knowledge about the principles of modular learning, the essence of block-modular learning, the advantages and significance of modular learning technology.*

### Purpose of studying of the discipline
*To study the basic characteristics of the technology of modular learning, the concept of ahead of the study of theoretical material with enlarged blocks, algorithmization of educational activity, the completeness and consistency of the cycles of cognition and other activities.*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline
- *Determine the general concepts and basic characteristics of the technology of modular learning.*
- *Explain the essence of block-modular learning, the advantages and significance of the modular teaching technology.*
- *To divide the content of discipline into components in accordance with didactic, pedagogical and professional tasks.*

### Prerequisites
*Bachelor*

### Postrequisites
*Research practice*

## Organization of pedagogical scientific research

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|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*In the discipline Organization of pedagogical scientific research, the following chapters are considered in depth: methods of scientific pedagogical research, determining the problem and subject of research-the first stage of scientific research, analysis of the state of the problem under study, initial stage of scientific pedagogical research, process and final stage of scientific pedagogical research, mathematical methods of statistical data processing in pedagogical research, pedagogical experiment*

### Purpose of studying of the discipline
*To study the principles of choosing methods of scientific and pedagogical research, the levels and classification of pedagogical research.*

### Learning Outcomes
*ON7 To design a system of evaluation criteria for various educational technologies used in educational institutions.*
*ON8 To solve problems arising in the course of research activities and requiring in-depth professional knowledge; choose the necessary research methods, modify existing and develop new methods based on the objectives of a particular study; methodology of natural science, socio-humanitarian and technical knowledge.*

### Learning outcomes by discipline
- *Consider the main criteria for the quality of pedagogical research;*
- *Explain the logic of research search through the implementation of a number of stages: empirical, hypothetical, experimental-theoretical;*
- *Analyze generally accepted methodological parameters and stages of pedagogical research and apply them in practice.*

### Prerequisites
*Bachelor*

### Postrequisites
*Research practice*

## Modern technologies of teaching chemistry in universities

| | |
|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This discipline provides for the study of modern technologies for teaching chemistry in universities, allowing the future teacher to design classes and lessons in order to achieve the educational goals provided for by the program for studying chemistry. When studying the course, students develop systemic knowledge about the techniques of chemistry teaching technologies.*

### Purpose of studying of the discipline
*To study modern interactive teaching methods used in the training of a specialist.*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline
- *Compare the legislative and non-commercial foundations of the organization of training at a university and at school.*
- *Formulate special professional competencies of future teachers in the field of teaching students to solve chemical problems.*
- *Explain the essence of modern interactive teaching methods used in the teaching of chemistry.*

### Prerequisites
*Bachelor*
### Postrequisites
*Research practice*

## Structural and substantive aspects of textbooks by chemical disciplines

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|---|---|
| Discipline cycle | Basic disciplines |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This course examines and reveals the importance of the textbook in teaching chemistry as a teaching system, the main components of textbooks, the organization of students` learning activities, the requirements for the content and structure of the text of the textbook, the content of existing and alternative textbooks in chemistry at school.*
### Purpose of studying of the discipline
*To acquaint undergraduates with the requirements and content of the structure of classical, electronic, multimedia and other modern textbooks in chemistry at school and higher education.*
### Learning Outcomes
*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*
### Learning outcomes by discipline
- *identify the principles and criteria for systematizing the definition of the content of textbooks in the course of chemistry;*
- *substantiate the content, level and place of the studied theory in textbooks;*
- *apply the basic principles of the selection of educational materials and substances that form the basis of chemistry in solving professional problems*

### Prerequisites
*Bachelor*
### Postrequisites
*Research practice*

## Methods of solving chemical problems in higher education

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|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*In this course, practical skills and abilities are formed to use natural science and mathematical knowledge for orientation in the modern information space, master the skills of a thought experiment when solving computational and experimental problems. The study of this discipline allows you to monitor learning outcomes using criteria-based assessment. The study of the course is necessary for the implementation of practical work as a teacher of higher education, as well as for the implementation of master`s methodological studies.*
### Purpose of studying of the discipline
*To study modern methods of solving chemical problems in higher education.*
### Learning Outcomes
*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*
### Learning outcomes by discipline
- *Consider the skills of a thought experiment in solving computational and experimental problems;*
- *Explain the role of natural science and mathematical knowledge for orientation in the modern information space;*
- *Analyze learning outcomes using criteria-based assessment.*

### Prerequisites
*Tertiary education*
### Postrequisites
*Pedagogical practice*

## Theoretical and applied aspects of modern organic chemistry and biochemistry

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|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This course expands the understanding of the main sections of dynamic, static, functional biochemistry, the functioning and regulation of the main biochemical processes in eukaryotes and prokaryotes. Based on the knowledge of organic and biochemistry using modern equipment and instruments, undergraduates acquire experimental skills in biological chemistry to solve specific experimental problems. The knowledge and skills acquired by students are necessary in the further process of teaching professional disciplines.*
### Purpose of studying of the discipline
*To study the methodological foundations of teaching biochemistry, methodological aspects of teaching the main sections of dynamic,*

*static, functional biochemistry.*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Demonstrate knowledge on theoretical and applied aspects of modern organic chemistry and biochemistry;*
- *choose teaching methods and ways of organizing the educational and cognitive activity of students in higher education in the discipline under study;*
- *Summarize ideas about the chemistry of organic substances, biopolymers and the technology of their synthesis.*

### Prerequisites

*Tertiary education*

### Postrequisites

*Pedagogical practice*

## Methodology for constructing tasks on functional literacy of students in chemistry lessons

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|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This course is an introduction to the practice of using PISA tasks for the development of functional literacy in chemistry lessons, solving various types of exercises: situational, practice-oriented tasks, open tasks with a number of visible features that are reflected in their conditions. In the course of teaching this discipline, undergraduates form a methodological understanding of the methods for constructing tasks of functional literacy of students in chemistry and aspects of their solution.*

### Purpose of studying of the discipline

*Formation of undergraduates` understanding of the main important aspects of the methodology for constructing functional literacy tasks in chemistry lessons.*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *To reveal the significant principles of constructing the tasks of functional literacy of students in chemistry;*
- *use the skills and abilities to search for scientific, technical and pedagogical information on the Internet when performing tasks independently;*
- *analyze theoretical knowledge in connection with practice;*

### Prerequisites

*Tertiary education*

### Postrequisites

*Pedagogical practice*

## Methods for solving chemical problems of increased complexity

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*The discipline is devoted to the study of methods for solving chemical problems of increased complexity. The solution of level tasks, tasks with industrial environmental content, taking into account the regional component, is considered. Students develop the skills and abilities to calculate problems of increased complexity, using a logical focus, the ability to apply mathematical calculations of high complexity to assess chemical problems in the course of scientific research.*

### Purpose of studying of the discipline

*To acquaint undergraduates with various types of chemical problems, teach them to solve problems from simple to problems of an increased level of complexity offered at international olympiads, show algorithms for solving chemical problems.*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Calculate the main indicators encountered in solving problems of increased complexity*
- *Analyze ways to solve problems*
- *Classify different types of tasks according to their degree of difficulty*

### Prerequisites

*Tertiary education*

### Postrequisites

*Pedagogical practice*

## Methodological aspects of teaching the organic chemistry and the high molecular compounds chemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This course expands and deepens the knowledge of undergraduates in electronic imaging in the theory of the chemical structure of organic compounds, the basics of conformational isomerism and stereochemistry. Considers the theory of reactions of organic compounds and the chemistry of macromolecular compounds. Forms the necessary set of knowledge, skills and abilities for undergraduates for independent planning and implementation of various types of training. Allowsyoutoindependentlysolvepedagogicalandmethodologicalproblems.*

### Purpose of studying of the discipline
*To acquaint undergraduates with specific exposition and assimilation of material on organic chemistry and chemistry of high-molecular compounds in high school*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline
- *describe the historical, methodological aspects of the disciplines, the principles of selection of educational material;*
- *explain the methodology of teaching organic chemistry and chemistry of the Navy, taking into account the role of organic chemistry and chemistry of the Navy in the development of a scientific worldview;*
- *to design the conduct of classes in chemical disciplines, in particular in organic chemistry and naval chemistry;*

### Prerequisites
*Tertiary education*

### Postrequisites
*Pedagogical practice*

## Scientifically-methodical bases of pre and profile training of students in chemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This discipline studies the essence and purpose of pre-profile and profile training; general provisions and organization of pre-profile and profile training. In the course of studying the discipline, the state of pre-profile and profile training in the Republic of Kazakhstan, the concept of teaching the organization of the educational process is considered. The study of the discipline allows you to master methodological approaches to the choice of teaching methods and the use of the main organizational forms of teaching chemistry within the framework of pre-profile and specialized elective courses.*

### Purpose of studying of the discipline
*To study the essence and purpose of pre-profile and profile training of students.*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline
- *Consider the state of pre-profile and profile training of students in the Republic of Kazakhstan;*
- *Explain methodological approaches to the choice of teaching methods in an elective course;*
- *Analyze the use of the main organizational forms of teaching chemistry within the framework of pre-profile and specialized elective courses.*

### Prerequisites
*Tertiary education*

### Postrequisites
*Pedagogical practice*

## Environmental and chemical aspects of the study of the atmosphere

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*The discipline is devoted to the study of the chemical and ecological properties of the atmosphere. Such as the composition and structure of the atmosphere, natural and anthropogenic factors affecting the state of the atmosphere, methods of air purification. This discipline contributes to the development of students` skills in determining the chemical composition of the atmosphere, predicting the behavior of pollutants in air objects, as well as the ability to analyze the data obtained as a result of research on the chemical composition of air.*

### Purpose of studying of the discipline
*To study the chemical and ecological properties of the atmosphere.*

### Learning Outcomes
*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*

*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Describe the composition and structure of the atmosphere*
- *Assess natural and anthropogenic factors affecting the state of the atmosphere*
- *Learn how to clean air masses*

### Prerequisites

*Bachelor*

### Postrequisites

*Pedagogical practice*

## Environmental and chemical aspects of the study of the lithosphere

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*The discipline is devoted to the study of the chemical and ecological properties of the lithosphere. Such as the composition and structure of the lithosphere, natural and anthropogenic factors affecting the state of the lithosphere, soil cleaning methods. This discipline contributes to the development of students` skills in determining the chemical composition of the lithosphere, predicting the behavior of pollutants in soil objects, as well as the ability to analyze the data obtained as a result of research on the chemical composition of soils.*

### Purpose of studying of the discipline

*To study the chemical and ecological properties of the lithosphere.*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Describe the composition and structure of the lithosphere*
- *Assess natural and anthropogenic factors affecting the state of the atmosphere*
- *Learn how to clean soil*

### Prerequisites

*Bachelor*

### Postrequisites

*Pedagogical practice*

## Chemico-ecological aspects of hydrosphere studies

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 1 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*The discipline studies the chemical and ecological properties of the hydrosphere. Such as the composition and structure of the hydrosphere, natural and anthropogenic factors affecting the state of the hydrosphere, methods of purification of water masses. This discipline contributes to the development of students` skills in determining the chemical composition of natural and industrial waters, predicting the behavior of pollutants in water bodies, as well as the ability to analyze the data obtained as a result of research on the chemical composition of waters.*

### Purpose of studying of the discipline

*To study the chemical and ecological properties of the lithosphere.*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Describe the composition and structure of the lithosphere*
- *Assess natural and anthropogenic factors affecting the state of the atmosphere*
- *Learn how to clean soil*

### Prerequisites

*Bachelor*

### Postrequisites

*Pedagogical practice*

## Methodological aspects of teaching of Physical Chemistry and Electrochemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline is devoted to the methodological aspects of teaching physical chemistry and electrochemistry. The issues of teaching methods of such sections as chemical thermodynamics, electrochemistry, catalysis, kinetics are considered. Students develop the skills of a methodical approach when studying topics of a physical and chemical orientation, the ability to apply scientific data in pedagogical practice, and also to mathematically express the results obtained in the course of scientific research.*

### Purpose of studying of the discipline

*To study the methodological aspects of teaching physical chemistry and electrochemistry.*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Describe the methodological aspects of teaching the sections of physical chemistry and electrochemistry*
- *Apply in practice the methodological aspects of teaching the topics of physical chemistry and electrochemistry*
- *To study the main problems that arise when presenting the topics of physical chemistry and electrochemistry*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Design of research activity of chemistry teacher

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|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This course reveals all aspects of the project activity method, the current classification, its types.Considers the main aspects of the theory and practice of design: the conceptual foundations of the project method, project typology, design methods, project structure, requirements for project documentation, rules for registration and protection, etc. During the training, it prepares future teachers for methodological support of project methodology and students for accompanying themin independent educational and cognitive activity.*

### Purpose of studying of the discipline

*To study the research activities of a teacher of an educational institution*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *choose the most effective research methods;*
- *develop research projects of practical importance*
- *Present the results of your own research.*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Actual problems of modern chemistry

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|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*The discipline studies topical problems of modern chemistry. One of the key problems of modern chemistry is chemical synthesis, atomic and molecular structure and electronic structure of newly synthesized compounds, as well as the development of new chemical materials, optimization of chemical processes, development of chemical energy. The study of this discipline contributes to the development of research skills in students, the ability to predict chemical phenomena in various fields of science.*

### Purpose of studying of the discipline

*To study actual problems of modern chemistry*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Formulate the key problems of modern chemistry of modern chemistry*
- *Apply in practice knowledge about the main problems of modern chemistry*
- *To analyze the application of the right approach in solving actual problems of chemistry chemistry*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Selected chapters of General chemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This discipline provides for the study of the sections of the course "General Chemistry", related to the structure of substances, mechanisms of chemical processes. The development of this discipline is a basis of creative thinking, the formation of a scientific worldview for undergraduates, contributes to the connection between chemistry and life, equips the future teacher with a set of knowledge.*

### Purpose of studying of the discipline
*A more detailed study of certain issues of the basic discipline necessary for the formation of a scientific and methodological approach in the creative activity of a future research scientist.*

### Learning Outcomes
*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline
- *Discuss the theoretical foundations of general chemistry and its applied aspects.*
- *Explain the basic patterns and laws of chemistry, the stability of substances and the direction of processes, the mechanisms of chemical reactions.*
- *Solve computational and experimental problems in general chemistry.*

### Prerequisites
*Tertiary education*

### Postrequisites
*Research practice*

## Innovation technologies in teaching chemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This discipline provides for the study of innovative methods, technologies and teaching methods, trends and directions for the development of world education. The development of this discipline is a basis for the formation of the ability to analyze and implement innovative technologies in the educational process. When studying the course, students develop systemic knowledge about interactive methods.*

### Purpose of studying of the discipline
*Formation of professional competencies of undergraduates through their mastery of knowledge about innovative models of education, technologies and methods of education, about trends and directions in the development of education in the world.*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline
- *Determine the trends and directions of development of education in the world.*
- *Explain the essence of innovative methods, technologies and teaching methods.*
- *Analyze and implement innovative technologies in the educational process.*

### Prerequisites
*Tertiary education*

### Postrequisites
*Research practice*

## Methods of development of electronic textbooks on chemical disciplines

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline
*This discipline studies the use of innovative educational tools. In the course of studying the discipline, undergraduates will master the classification of educational resources, receive general information about electronic textbooks and the structural organization of an electronic textbook; be able to distinguish between the advantages and disadvantages of an electronic textbook. The course also discusses the forms and methods of teaching chemistry using electronic resources and provides an overview of educational resources in chemistry on electronic media.*

### Purpose of studying of the discipline
*To study innovative educational means (personality- oriented technologies; technologies of differentiation and individualization; specialized training; information technologies and others).*

### Learning Outcomes
*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*

*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Consider educational resources according to various classifications;to study the forms and methods of teaching chemistry using electronic resources.*
- *Explain the structural organization of the electronic textbook;*
- *Analyze the advantages and disadvantages of the electronic textbook and the factors of intensification of the educational process with the help of electronic textbooks.*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Methodological aspects of the study course “Structure of Matter”

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline provides for the study of modern problems of the structure of matter, the stability of the molecular form of matter; electrical, magnetic and optical properties, condensed phases: crystals, liquids, mesophases, amorphous substances, quasicrystals, nanocrystals. When studying the course, students develop systemic knowledge about experimental and theoretical methods for studying the structure of molecules and substances.*

### Purpose of studying of the discipline

*To study modern problems of the structure of matter.*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Explain the problems of the structure of matter, the stability of various forms of substances.*
- *Distinguish electrical, magnetic and optical properties of substances, condensed phases.*
- *Analyze experimental and theoretical methods for studying the structure of matter.*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Methodological aspects of the study courses "Catalysis" and "Colloid Chemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline is devoted to the study of the methodological aspects of the courses "Catalysis" and "Colloid Chemistry". The types of catalysis, methods of application in industry, the main issues of colloid chemistry, such as the composition, properties and preparation of dispersed systems, purification and diffusion of sols are considered. Students develop skills in working with colloidal systems, the ability to analyze the results obtained, plan an experiment and use mathematical methods for expressing results.*

### Purpose of studying of the discipline

*To study the main sections of the courses "Catalysis" and "Colloid Chemistry".*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Describe concepts such as heterogeneous and homogeneous catalysis*
- *Apply in practice the methodological aspects of the study of dispersed systems*
- *Analyze the composition and properties of disperse systems*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Methodical aspects of studying of a course “General chemical technology”

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline provides for the study of the methodological foundations of teaching chemical technology, teaching methods for the*

*basic laws of chemical technology, the most important chemical industries. When studying the course, students develop systematic knowledge in the field of methodology for studying modern problems of chemical technology at the level of the current state of science and industry.*

### Purpose of studying of the discipline

*Get acquainted with chemical production as a complex chemical- technological system, mainly at a general level and, accordingly, consider the general problems of analysis and synthesis of chemical production.*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Formulate the concepts that form the basis of basic knowledge of the theoretical foundations of chemical technology.*
- *Explain the role of studying the issues of chemical technology in the system of training highly qualified teachers of chemistry.*
- *Analyze the basic laws of chemical technology.*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Methodological aspects of teaching analytical chemistry and chemistry of rare elements

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline is devoted to the study of methodological aspects of teaching analytical chemistry and chemistry of rare elements. Questions of qualitative and quantitative analysis, physicochemical methods of analysis are considered. Students develop methodological skills to determine the qualitative and quantitative composition of a substance, perform calculations to determine chemical pollutants in the environment, draw logical conclusions and develop the skills necessary for a higher education teacher.*

### Purpose of studying of the discipline

*To study the methodological aspects of teaching analytical chemistry and chemistry of rare elements.*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Find the qualitative and quantitative composition of the substance*
- *Identify cations and anions in the composition of chemicals*
- *Calculate the quantitative indicators of the composition of the substance*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Methodological aspects of teaching the history of chemistry

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*In this course, the research skills of undergraduates are formed through the study of the problems of the philosophy of chemistry and the history of science; ideas about the modern methodology of scientific knowledge are studied; about the analysis of the theoretical and empirical possibilities of the main participants in modern science research and about overcoming one- sided approaches, both subjectivist and objectivist. The correlation of the course of the history and methodology of chemistry with the general methodology of natural science and philosophy is determined.*

### Purpose of studying of the discipline

*To form the research skills of undergraduates through the study of the problems of the philosophy of chemistry and the history of science.*

### Learning Outcomes

*ON4 To form practical skills of teaching methods and training in universities.*
*ON5 To develop educational resources using modern means of information and information technologies in the educational process.*
*ON6 To link educational material on all issues of the university program of chemical disciplines for daily professional activities.*

### Learning outcomes by discipline

- *Consider ideas about the modern methodology of scientific knowledge;about the analysis of the theoretical and empirical possibilities of the main participants in modern science research;*
- *Explain the history and methodology of chemistry in accordance with the general methodology of natural science and philosophy;*
- *Critically analyze one-sided approaches of both subjectivist and objectivist persuasion.*

### Prerequisites

*Tertiary education*

### Postrequisites

*Research practice*

## Modern biochemistry radiation problems

| | |
|---|---|
| Discipline cycle | Profiling discipline |
| Course | 2 |
| Credits count | 5 |
| Knowledge control form | Examination |

### Short description of discipline

*This discipline studies the effect of ionizing and non-ionizing radiation on biological objects. Consider questions about the radiation background, its components, about the main methods of registration of ionizing radiation. Issues of radiation biochemistry of bioorganic molecules, problems of radiation ecology and hygiene are discussed. They will solve situational problems on the topic of the lesson.*

### Purpose of studying of the discipline

*Formation of undergraduates` system of ideas about the role of radiation-biochemical research in solving the main problems of modern radiobiology.*

### Learning Outcomes

*ON2 Apply modern pedagogical technologies in everyday professional activities in the process of learning chemistry.*
*ON3 To solve the problems of higher pedagogical education and the prospects for its further development;to consider the use of effective University technology;to solve current and psychological and pedagogical problems,to evaluate the results achieved.*

### Learning outcomes by discipline

- *Reveal the main radiation-biochemical patterns in the change in the state and metabolism in the cells and tissues of the irradiated organism;*
- *To reveal the significance of biochemical indicators of radiation damage in critical organs of the body to characterize the causes of the formation of visible manifestations of biological effects;*
- *Prepare and perform practical work on the studied discipline*

### Prerequisites

*History and philosophy of science*

### Postrequisites

*Research practice*