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Higher and Postgraduate Educational Programs

☐ Project EP ☒ Participant of project EP

OHPE (Developer)

West Kazakhstan University named after Makhambet Utemisov NPJSC

Title of project EP

Co-developers

Pavlodar Pedagogical University named after Alkey Margulan NPJSC non-profit joint-stock company "Shakarim University"

Date of registration in the Registry

31.05.2024

Registration number

6B01500448

Date of EP passport updating

03.08.2026 09:32

Field of education

6B01 Pedagogical sciences

Direction of personnel training

6B015 Training of teachers in Natural science subjects

Group of educational programs

B012 Teacher training in chemistry

Educational program

6B01514 Chemistry (IP)

EP purpose

Training a chemistry teacher with conceptual knowledge in the field of chemical sciences, modern methods of teaching, entrepreneurial and managerial skills, social and civic responsibility, able to carry out pedagogical activities based on competencies.

EP type

Innovative EP

Level on NQF

6

Level on SQF

6

EP distinctive features

No

Language of education

Russian Kazakh

Professional Standard for EP

Exists

№	Name of professional standard
1	Professional standards for teachers of educational organizations

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ЕДИНАЯ ПЛАТФОРМА
ВЫСШЕГО ОБРАЗОВАНИЯ

English

developing EP

Professional standard №1

Professional standard

Профессиональные стандарты для педагогов

Approval year

2024

CCEA

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Professions

Profession №1

Profession

Учителя средней школы

Уровень по ОРК

6

Labor functions

Осуществление учебного процесса.

Осуществление классного руководства.

Приобщение обучающихся к систематическому обучению.

Осуществление учебно-методической деятельности.

Оценивание учебных достижений обучающихся.

Profession №2

Profession

Педагоги колледжей и других образовательных учреждений

Уровень по ОРК

6

Labor functions

Осуществление деятельности руководителя учебной группы.

Осуществление научно-методической деятельности.

Осуществление учебного процесса с учетом индивидуальных способностей и потребностей обучающихся.

Проведение мониторинга образовательных достижений обучающихся.

Volume of the credits

240

Degree to be conferred

Bachelor

Period of study

4

Date of approval EP on the Academic Council

27.04.2026

Date when EP was approved by the Republican Educational and Methodological Board of the Ministry of Science and Higher Education of the Republic of Kazakhstan

18.05.2023

☒Existence of the annex to the license for the direction of personnel training

The license number on the direction of training

KZ49LAM00007465

☐The training format is online

☒EP accreditation existence

Atlas of new professions

не предусмотрено

https://epvo.kz/#/user/rep/passports/application/75635

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The formed educational outcomes

№	Educational outcome	Code	Reflects the labor function
1	Assess the surrounding	ON1	Осуществление учебного процесса. Приобщение обучающихся к системе ценностей Осуществление учебного процесса с учетом индивидуальных способностей и потребностей
2	Apply knowledge	ON2	Осуществление учебного процесса. Осуществление классного руководства. Осуществление деятельности руководителя учебной группы. Осуществление учебного процесса с учетом индивидуальных способностей и потребностей
3	Constructively build	ON3	Осуществление учебного процесса. Осуществление классного руководства. Осуществление деятельности руководителя учебной группы.
4	Apply the methods of	ON4	Осуществление научно-методической деятельности. Осуществление учебно-методической деятельности.
5	Demonstrate	ON5	Осуществление учебного процесса. Осуществление учебно-методической деятельности
6	Collect and interpret	ON6	Осуществление научно-методической деятельности. Проведение мониторинга образовательных достижений обучающихся. Оценивание учебных достижений обучающихся.
7	Apply practical	ON7	Осуществление учебно-методической деятельности. Проведение мониторинга образовательных достижений обучающихся. Осуществление учебного процесса с учетом индивидуальных способностей и потребностей Оценивание учебных достижений обучающихся.
8	Synthesize knowledge	ON8	Осуществление учебного процесса. Осуществление учебно-методической деятельности Осуществление учебного процесса с учетом индивидуальных способностей и потребностей Приобщение обучающихся к системе ценностей.

Data on disciplines

№	Name of discipline	Short description of discipline	Cycle
1	Fundamentals of Scientific Research	The goal is to form knowledge about the principles, technologies, practical methods and techniques of conducting scientific research based on modern achievements of scientists. Forms the basic foundations of scientific culture and ethics, flexible perception of scientific texts, skills of effective application of acquired knowledge in planning and organizing research work, the ability to analyze and summarize research results.	GED
2	Ilyastanu	The purpose of the discipline is to develop a deep-thinking personality with high aesthetic taste, appreciating literature, art, traditions, culture and language of the Kazakh people through a deep and comprehensive study of the works of Ilyas Zhansugurov. Forms an understanding of the importance of the works of Ilyas Zhansugurov in the development of the Kazakh literary language; skills of intellectual and creative thinking, the ability to cherish the values of national and spiritual heritage.	GED
3	Fundamentals of Financial Literacy	The course is aimed at gaining knowledge and skills in the field of personal finance management. Also, as part of the course, students will learn how to use in practice all kinds of tools in the field of finance, save and increase savings, plan a budget competently, learn how to analyze financial information and navigate financial products to choose an adequate investment strategy.	GED

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4	Basics of Law and Anti - corruption Culture	law, the basics of an anti-corruption culture, as well as the laws of the emergence, development and functioning of the state and law. The course forms the skills of an anti-corruption culture and a high level of theoretical knowledge about the main functions of law in the state and society, its impact on the development of law-based state, civil society.			GED
5	Ecology and Life Safety Basics	Purpose – to form knowledge on the basics of ecology and life safety, allowing to analyze environmental processes, assess the socio-ecological consequences of anthropogenic activities, methods and technologies of protection in emergency situations. Develops skills to assess the impact of environmental factors on human health; predict environmental processes for planning and implementing measures to improve life safety; make decisions in adverse environmental and emergency situations, taking into account the possible consequences of accidents, catastrophes, natural disasters.			GED
6	Economics and Entrepreneurship	The purpose is to familiarize students with the economic problems of modern society, the formation of economic thinking and gaining knowledge in the field of theoretical foundations and practical skills in the field of entrepreneurship. It is focused on the formation of students' comprehensive understanding of the laws of the functioning of the economy, obtaining business education aimed at acquiring applied competencies in various fields of entrepreneurial activity, reveals the features of creating and successfully running their own business.			GED
7	Assessment and Development	Pre-service teachers have a thorough understanding of the meaning of assessment in learning process and are able to provide constructive assessment in ethical manner in different phases of learning processes and engage learners in assessment. Pre-service teachers identify, differentiate, and use different assessment technologies, principles, stages, and assessment tools in their own field of expertise (including formative and summative assessment and self- and peer- assessment, etc). They can critically evaluate and analyze their understanding and practices concerning assessment and develop them further. Pre-service teachers who demonstrate competence can: use and apply a variety of methods and tools of assessment and feedback (formative and summative assessment); apply pedagogical principles in defining and recognizing competence levels of learners; understand the importance and support the development of students' self- and peer-assessment skills.			BD
8	Age and Physiological Features of the Development of Children	Pre-service teachers are familiar with the formation of psyche, its functioning, and the patterns of development. Pre-service teachers can observe the development of their students, and accordingly, plan and implement age-appropriate learning processes considering individual needs of students. Pre-service teachers act creatively and appropriately in different situations and support learning and well-being of the learners. Pre-service teachers who demonstrate competence can: recognize the individual starting points of different students, their learning potential and specific support needs; consider the individual needs of their students for specific support, guidance, teaching and assessment; introduce various methodological solutions for inclusion and for providing specific support.			BD
9	Inorganic Chemistry	During the course, pre-service teachers develop a foundation of general chemical training and scientific outlook, as well as creative thinking as future specialists. When studying the course, they develop modern understanding of quantum-mechanical ideas about the nature of the electron and the structure of the atom, as well as the basic theories of chemical processes. The course is a basis for further study of individual sciences of the chemical cycle and contributes to a deeper understanding of the design of the periodic system and its significance, the theory of the structure of the atom, and the theory of chemical bonding. The course helps pre-service teachers to establish causal relationships between the composition, structure, properties, and use of substances. Pre-service teachers demonstrating competence can: understand the academic language of chemical concepts and terms; make formulas and give correct names to oxides, acids, bases and salts; express the essence of reactions by abbreviated ionic equations and apply the knowledge gained to characterize the chemical properties of acids, bases, salts; give a comparative characteristic of the elements; conduct experiments using elementary methods of chemical research of substances and compounds to form research skills.			BD

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10	Educational Science and Key Theories of Learning	conceptions of man leading to various learning theories and pedagogical models. Based on their understanding of the theoretical concepts, pre-service teachers are able to make appropriate pedagogical choices for various learning situations. Pre-service teachers who demonstrate competence can: distinguish between concepts of human and their importance for understanding learning and the design of an educational process; differentiate between learning theories and their importance for understanding learning and the design of an educational process; apply learning theories and pedagogical models suitable for versatile learning processes.	BD
11	Psychology in Education and Concepts of Interaction and Communication	Pre-service teachers are familiar with the modern psychological theories and models, as well as personality functioning and individual properties. They can apply the knowledge in their teaching in diverse educational contexts. Pre-service teachers support positive development of learners by fostering dialogue, interaction, and communication in the educational process. They are able to communicate, interact, and collaborate with pupils’ families as well as in various other partnership networks and create new relationships suitable for the development of their own pedagogical activity. Pre-service teachers who demonstrate competence can: understand the basic concepts and terms of educational psychology, and the main practical applications of psychological knowledge; understand the patterns, facts, and phenomena of cognitive and personal development of a person in the processes of education and upbringing; apply an integrated approach to design, implementation, evaluation, and development of educational environments; understand the concept of continuous learning as a part of the process of cognitive and personal development of a person. apply basic communication and interaction concepts and theories at the individual, community, and network levels; select the methods of communication and interaction that are most appropriate to facilitate learning in various forms (offline, online, blended, hybrid); recognize the patterns of group dynamics and act in ways that promote community development and well-being.	BD
12	Fundamentals of Artificial Intelligence	The discipline is aimed at studying the basic concepts, methods and algorithms underlying the creation and application of artificial intelligence. In this course, students will study the theoretical foundations of machine learning, neural networks, natural language processing algorithms and computer vision. They will also get acquainted with the ethical, social and legal aspects of the application of artificial intelligence in various spheres of life.	BD
13	Research, Development, and Innovation	To stay up-to-date and be able to continuously develop themselves and their work, pre-service teachers acquire new research-based knowledge and conduct practice-based research in an ethical manner in various networks concerning the development of education and teacher profession, innovative approaches to learning, as well as learning and guidance of students. Pre-service teachers adopt development-oriented mindset and are able to develop, update and apply innovative teaching approaches and technologies in the context of ongoing changes in society and the educational environment. Pre-service teachers design a small-scale research project to familiarize themselves with research-based development of their work as teachers. They identify their research topic/questions, conduct the literature review and design the methodology for the data collection and analysis, including ethical aspects of research. After the course, pre-service teachers are able to develop and update their pedagogical activities based on ethically conducted research and development and carry out or participate in research projects. They are also able to present their research and development results using various professional forms and channels. Pre-service teachers who demonstrate competence can: evaluate their own professional activities and work environment to find areas for improvement; apply a research-based approach to their professional activities and carry out independent research work; consider and apply ethical aspects of research procedures; apply critical thinking in data collection and utilization for the development of initial teacher education; participate in scientific design research and / or develop cooperation between universities and stakeholders; document their own research activities and present the results using various forms of communication.	BD

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18	Mathematics and Physics in Chemistry	selected sections of mathematics and physics, which are the basis for the development of fundamental chemical disciplines: - "Elements of probability theory and mathematical statistics" and "Mathematical analysis": composing equations with one and two unknowns, rounding numbers, differential calculus of functions of one and two variables; - "Graph Theory": visual interpretation of data and research results; - "Molecular Physics and Thermodynamics", "Atomic and Nuclear Physics": gas laws and laws of thermodynamics, the heat of dissolution of salts, the heat of neutralization; the nature and properties of radioactive radiation; - "Optics": optical properties of dispersed systems, scattering, absorption, reflection, refraction of light and Rayleigh's laws During the course, pre-service teachers develop their understanding and skills in applying the knowledge to explain the chemical properties of substances based on their structure and physical properties. Pre-service teachers demonstrating competence can: apply knowledge when composing an equation with one and two unknowns, rounding numbers, differential calculus of functions of one and two variables in calculations of the quantitative determination of a substance; design mathematical models of chemical processes; explain the nature and properties of radioactive radiation; apply gas laws and laws of thermodynamics to determine the mass of a mole of a substance by measuring its volume in a gaseous state; determining the heat of dissolution of salts, the heat of neutralization; describe the optical properties of dispersed systems, scattering, absorption, reflection, refraction of light and coloring of light solutions based on Rayleigh's laws; describe chemical changes occurring under the influence of light; simulate the process of radioactive decay.	BD
19	Methods and Technologies of Teaching Chemistry	Pre-service chemistry teachers have a comprehensive understanding of teaching strategies and methodologies, and can apply them in planning, teaching, and assessment in innovative ways matching the specific pedagogical situations, conditions of a specific school and the capabilities of students. Pre-service chemistry teachers are able to design suitable inclusive physical and online learning environments at different stages of the educational process. Pre-service chemistry teachers understand and can apply the regulations of copyright and data protection in their learning material planning. Pre-service chemistry teachers possess necessary knowledge of didactics, learning technologies and methods of motivating students being able to provide necessary pedagogical assistance to students. Pre-service chemistry teachers who demonstrate competence can: select pedagogical models suitable for teaching; apply teaching methods in a creative and varied manner, considering the opportunities offered by learning technologies; use a suitable inclusive learning environment in their teaching; acknowledge and apply the norms and principles of copyright and data protection; apply guidance methods to motivate students and to support their learning achievements.	BD
20	Academic Letter	During the course, pre-service teachers develop their academic writing skills, registration of all types of written works, in accordance with existing requirements. They become proficient in communication and teamwork technologies, as well as communication strategies. They also investigate the features of academic writing, ways of correct writing and execution various types of written work in accordance with the principles of academic integrity. Pre-service teachers demonstrating competence can: prepare and execute the submitted works in accordance with the existing requirements: a scientific essay, an experimental research report, a description and results of project activities, etc. document the sources of information on one of the citation systems to comply with intellectual property rights; work with databases of scientific publications, bibliographic sources, make references to the sources used.	BD



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21	Biochemistry	structure of bioorganic substances to explain metabolic processes in the body. They also conduct a biochemical analysis to study the structure of various substances. Pre-service teachers learn to follow the logical relationship between the stages of the experiment and the basics of related sciences, and master the skills in conducting a school chemical experiment. Pre-service teachers demonstrating competence can: explain the patterns and possibilities of chemical processes and energy conversion in a living organism; describe the mechanisms of regulation of chemical transformations occurring in the body and their role in ensuring vital activity; conduct a full cycle of experimental research.	BD
22	Chemistry of Complex Compounds	Knows the basic concepts of the chemistry of complex compounds, chemical bonding in complex compounds. Has knowledge of the complexing ability of the elements of periodic systems and main classes of coordination compounds. Describes the principles of synthesis and reaction of complex compounds. Applies thermodynamics of coordination compounds, theory of ionic equilibria in the application to the chemistry of complex compounds. Arguments the factors influencing the stability of complex particles. Possesses the skills of analyzing complex compounds.	BD
23	Colloidal Chemistry	During the course, pre-service teachers develop their knowledge and skills in managing colloidal chemical processes in biological systems. They select the colloidal-chemical content of training for elective courses and extracurricular work at school, as well as find a connection between the content of the discipline and the educational and life experience of students. Pre-service teachers demonstrating competence can: show the importance of knowledge of the properties of colloidal substances in everyday life, technological processes of industry and agriculture, biology, medicine and ecology; apply the fundamentals of fundamental knowledge in the field of colloidal chemistry to solve situational problems of everyday life; select colloidal chemical content for conducting experiments with solutions of high-molecular compounds and surfactants during elective courses.	BD
24	Environmental Chemistry	During the course, pre-service teachers build their knowledge about the basic principles of environmental chemistry on a local and global scale. Pre-service teachers give scientific substantiations of the processes occurring in the environment using knowledge in the field of physics, chemistry, Earth sciences and biology. They also apply methods of analysis of physico-chemical processes involving pollutants in the atmosphere, hydrosphere, and soil. During the course, pre-service teachers develop their civic position to realize the responsibility of their decisions and actions. Pre-service teachers demonstrating competence can: form an understanding of the basic principles of environmental chemistry; form their own moral and civic position for their decisions and actions; apply knowledge in the field of physics, chemistry, Earth sciences and biology for scientific substantiation of processes occurring in the environment; assess anthropogenic changes in environmental objects.	BD
25	Teaching Structural and Substantive Sections of Chemistry at school	During the course, pre-service teacher develop their professional competences as a chemistry teacher in the field of implementing the requirements of the mandatory educational state standard of the Republic of Kazakhstan to the content and structure of chemical education, as well as the basic principles of its formation and conditions of implementation. During the course, pre-service teachers explore through activity-based and personality-developing approaches, the challenges of implementing chemical education in secondary schools, selecting and structuring educational content within the framework of the methodology of standardization of general education. Pre-service teachers demonstrating competence can: use the actual, conceptual, procedural and metacognitive knowledge of school students in chemistry lessons; analyze the content and concepts of the school chemistry course taking into account the requirements of new educational standards; systematize, generalize the acquired knowledge to work with educational and didactic materials on chemistry, equipment and technical means available in the school chemistry classroom, including digital resources.	BD

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26	Polymer Chemistry	the basic laws of reactions of production and transformation of plastics and elastomers, and the features of their chemical structure. They also use their knowledge in natural science to discuss the physico-chemical and kinetic features of polymer production. Pre-service teachers also analyze the rheological and relaxation properties of the obtained polymers and generalize the knowledge gained. Pre-service teachers demonstrating competence can: apply knowledge about high-molecular compounds, chain and step processes of formation of macromolecules, chemical reactions of polymers to substantiate the characteristics of new composite polymer materials; conduct and analyze laboratory experiments to study the structure and composition of polymers; assess the main characteristics of polymer materials and indicate the areas of their application, including nanotechnology.	BD
27	Chemistry of Rare Elements	Knows the position of rare elements in the periodic table of elements of D.I. Mendeleev, their common comparative characteristics, distribution in nature, physical and chemical properties. Analyzes rare elements and their compounds, calculates the concentration of solutions of compounds of rare elements, determines the content of components. Explains the use of rare elements in various fields of science, technology and technology.	BD
28	Chemistry in Everyday Life	During the course, pre-service teachers develop their knowledge about the composition and properties of household chemicals. They also develop their functional literacy skills to use the obtained chemical information in a particular sphere of life and activity. Pre-service teachers learn to respect for one's health and the environment as well as the creation of a safe and favorable environment. Pre-service teachers demonstrating competence can: highlight the main points in the instructions and labels on the use of various chemicals, washing powders, cleaning agents, etc.; explain the influence of household chemicals on metabolic processes in the body; handle household chemicals in a safe way; use the information received in the field of household chemicals in a particular area of life and activity.	BD
29	Organization of Students' Project Activities in Chemistry	During the course, pre-service teachers develop their abilities in managing and organizing project activities of students. They use their research skills in conducting educational projects in scheduled and extracurricular activities in chemistry using the opportunities of the educational environment. They also utilize the interaction with the other school subjects in the educational process generalizing a more advanced pedagogical experience. Pre-service teachers develop their ability to independently organize project activities in teaching chemistry. Pre-service teachers demonstrating competence can: organize and plan project activities in chemistry for students at school; direct and advise the self-organization of joint active research based on problem solving; evaluate the project activities of the group according to the developed criteria; teach students to argue their judgments on the topic of research.	BD
30	Chemistry Laboratory and Risk Management	During the course, pre-service teachers acquire regulatory and legal knowledge about the safety and labor protection rules. They develop their primary professional skills when working in a chemical laboratory and become familiar with the functions and job responsibilities of a laboratory assistant. Pre-service teachers demonstrating competence can: · prepare instruments for laboratory tests, perform statistic analysis processing, evaluate the reproducibility and correctness of the analysis; identify the risks associated with storing chemicals in the laboratory, handling dishes and equipment, conducting experiments and waste disposal; manage risks through documenting safety procedures: draw up a manual of educational laboratories, study the manuals of devices and equipment, instructions for the use of equipment, keep safety logs.	BD



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31	Ecological Education and Sustainable Development	understanding of the global consequences of human influence on nature, the prospects for the transition of the world community to sustainable development, and the general patterns of interaction of living organisms with the environment. During the course, pre-service teachers develop their logical thinking in the analysis and search for optimal solutions to problems in the field of environmental education and nature conservation. Pre-service teachers demonstrating competence can: apply knowledge of the content of the concept of sustainable development to discuss the global consequences of human influence on nature; discuss and analyze the most acute and complex problems in the field of ecology and nature management, taking into account the main provisions of the concept of sustainable development to assess human impacts on the environment; plan and organize environmental protection measures against environmental pollutioncorrelate the proposed actions in the field of environmental management with the recommendations of international conventions and other treaties ratified in the country.	BD
32	Analytical Chemistry	During the course, pre-service teachers examine the main theoretical issues of analytical chemistry, as well as the methods of qualitative and quantitative analysis. They develop their knowledge of identification, detection, separation, and determination of chemicals. They also acquire skills in performing and completing experimental work, and handling reagents and equipment, as well as safety techniques. Pre-service teachers demonstrating competence can: describe the basics of qualitative and quantitative research methods; explain the principles of titrimetric methods of analysis in determining the quantitative composition of a substance; master the technique of performing individual operations in a chemical experiment (weighing, dissolving, heating, filtering, drying, calcination, etc.,); conduct a qualitative analysis to determine cations and anions, explain the essence of specific reactions and their analytical effects; perform calculations of theoretical titration curves; analyze and process the results obtained from the point of view of scientific laws and facts of related disciplines; evaluate the results of the experiment through the determination of systematic and random errors.	PD
33	Chemistry oh High - molecular Compound	Has an idea of the current level of polymer chemistry, the variety of practical applications of polymer materials, the main polymerization and polycondensation processes. He knows the methods of obtaining polymers, initiators and catalysts of synthesis of IUDs, the conditions of formation of the structure of polymers, the main types of chemical transformations of polymers, the classical theory of polymer solutions.	PD
34	Chemistry of the Elements of the Periodic System	He studies the elements of the main subgroups in the periodic system (s- and p-elements), the elements of the main subgroup VII, VI, V, IV, III, II, VIII groups. General properties and methods for producing metals. General characteristics of the properties of the elements of the main subgroups of the periodic system D.I. Mendeleev. Elements of a secondary subgroup VII, VI, V, IV, III, II, I, VIII. Elements of the f-family (lanthanides and actinides). Knows the physical and chemical properties of the elements of the periodic system and their compounds, methods of obtaining them in the laboratory and at work, their use.	PD
35	Biogeochemical Analysis of Natural Objects	During the course, pre-service teachers determine the effects of chemicals on water, soil, and biological objects as well as the possibility of solving the problems that arise with the means and methods of chemical analysis. Pre-service teachers deepen their skills in conducting an experiment using modern methods of studying the elemental and material composition. The course is implemented with a multidisciplinary approach, which allows pre-service teachers to connect generalized facts from different academic subjects with their common knowledge system and find their applications in practice. Pre-service teachers demonstrating competence can: explain the effects of chemicals on water, soil and biological objects, and the possibility of finding ways of disinfection by means and methods of chemical analysis; justify the choice of optimal sampling methods for various natural objects; plan and perform safe chemical and analytical studies with natural objects; carry out metrological and statistical processing of the results of biogeochemical analysis; interpret and critically analyze the results of biogeochemical studies.	PD



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36	Physical Chemistry	and acquire modern understanding about the structure of substances and the chemical process based on the laws of thermodynamics and kinetics. They explore the theoretical foundations of classical and statistical thermodynamics, and ways of applying thermodynamic methods to solve chemical problems. When studying the course, pre-service teachers build their knowledge and skills in modeling and performing numerical calculations when describing and explaining various types of chemical and phase equilibria and properties of substances in solutions. Pre-service teachers demonstrating competence can: formulate laws and concepts of physical chemistry with reasoned judgments; describe the structure and properties of the main phase states of a substance (gases, solids and liquids); discuss the physico-chemical basis of surface phenomena and factors affecting free surface energy and features of adsorption at the interface of phases; analyze phase equilibria based on state diagrams; perform safe experiments using physico-chemical devices.	PD
37	Solving Problems in Chemistry	During the course, pre-service teachers apply the acquired knowledge to solve basic and more complex level problems of the school chemistry course. They also investigate methods of solving theoretical, computational and experimental problems of various complexity. Pre-service teachers demonstrating competence can: apply knowledge of stoichiometric laws of chemistry to solve computational and experimental problems; apply knowledge of experimental calculation methods to solve practice-oriented tasks of a scientific, laboratory and educational nature; use the knowledge of related sciences to convert formulas and perform calculations.	PD
38	Fundamentals of Chemical Production	The course focuses on the study of the basic principles of chemical production, types of chemical pollution of the environment and its consequences. The discipline forms the students' understanding of modern production processes and the structure of chemical engineering systems. The study of the discipline contributes to the application of knowledge to analyze and assess the probability of occurrence of technological processes. Pre-service teachers demonstrating competence can: determine the positive and negative environmental impacts of the chemical production operations under consideration; design methods and techniques for constructing process diagrams of production; compose the main characteristics of a chemical process; assess the technological efficiency of production; and provide arguments for efficiency of production in view of resource- and energy-saving technologies. evaluate the prospects of development of the nuclear industry in Kazakhstan.	PD
39	Methodology for Solving Problems in Inorganic Chemistry using AI	Knows the structure, content, goals and objectives of the updated educational program in secondary schools and can use it in solving problems of inorganic chemistry. Mastering the skills and methods of solving problems at different levels of inorganic chemistry, knowledge of the genetic relationship and the theoretical basis between classes of inorganic compounds.	PD
40	Methodology for Conducting a Chemical Experiment in Middle school using AI	Examines the functions and forms of school chemistry experiments and the requirements for educational equipment designed for setting up chemical experiments. Knows the content, structure, goals and objectives of a chemical experiment in high school. Working with chemical utensils and equipment, he is able to calculate the quantitative and qualitative quantities of reagents, and he observes safety rules.	PD



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41	Kinetics and Catalysis	basic laws and concepts of formal kinetics, elementary stages and kinetic patterns of homogeneous, heterogeneous and enzymatic catalytic transformations, and physico-chemical methods for studying the surface and nanostructure of the catalyst. They also improve their skills in composing a system of kinetic equations and analyzing the mechanisms of chemical reactions. The course helps future chemistry teachers to apply the teaching content in the school curriculum and elective courses, as well as to find a connection between the content of the discipline and the educational and life experience of students. Pre-service teachers demonstrating competence can: apply the equations of formal kinetics and kinetics of complex, chain, heterogeneous and catalytic reactions for calculations related to the determination of kinetic parameters and kinetic characteristics of chemical processes; conduct chemical experiments using laboratory chemical devices and equipment to determine kinetic parameters; analyze and evaluate the patterns and possibilities of chemical processes and energy conversion.	PD
42	Fundamentals of Applied Behavior Analysis	Course goal – to develop the ability, grounded in Applied Behavior Analysis (ABA), to critically analyze data-based functions of behavior; design and implement individualized interventions in inclusive educational settings; and evaluate their effectiveness, safety, and ethical soundness. Develops skills to: operationalize behavior; collect and analyze data (incl. ABC); identify behavioral functions; design and apply behavior support plans; teach functionally equivalent alternative behavior; manage crisis situations; and assess outcomes.	PD
43	Nanochemistry	During the course, pre-service teachers develop a system of knowledge about nanochemistry, synthesis and analysis of nanomaterials, as well as application of nanotechnology in organic chemistry, biology and medicine. Pre-service teachers apply the knowledge about the possibilities of nanotechnology and modifications of nanoobjects in the development of elective courses, as well as find a connection between the content of the discipline and the educational and life experience of students. They also integrate knowledge related to the achievements of nanochemistry and nanotechnology. Pre-service teachers demonstrating competence can: formulate basic concepts about the nature of nanomaterials and nanoscience, about their classification and special physico-chemical properties; discuss existing and prospective applications of nanotechnology and nanomaterials; work with databases of scientific publications, bibliographic sources and scientific literature on topical issues of nanochemistry; assess the harmful effects of nanomaterials on the environment, human health and safety, as well as ways to prevent them.	PD
44	Radiochemistry	During the course, pre-service teachers develop their knowledge and understanding of the terms and definitions of radiation chemistry, various sources of ionizing radiation, dosimetric systems used in practice, as well as radiolysis of clean water. During the course, pre-service teachers become aware of the effects of ionizing radiation on living organisms and develop respect for environmental objects. They also develop their analytical thinking and self-study skills, using the knowledge of related sciences. Pre-service teachers demonstrating competence can: explain the effects of ionizing radiation on various biological objects; compose and describe the equations of the radioactive decay reaction; calculate the radiation yield of radiolysis products with known parameters and experimental data; justify the decisions made on the safety of people in various life situations.	PD



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45	Thermochemistry	thermal effects of reactions with various physico-chemical parameters. They also develop their skills in discussing the factors influencing the direction of chemical reactions, the methods of qualitative and quantitative description of the equilibrium state of thermodynamic systems, and modern ideas about the chemical process. During the course, pre-service teachers apply the knowledge of the laws of thermodynamics and their consequences, as well as general approaches to the description of the equilibrium state of thermodynamic systems. Pre-service teachers demonstrating competence can: discuss chemical phenomena with a thermal effect occurring in nature, in a living organism; apply knowledge of the basic laws of thermodynamics when discussing the results obtained with the involvement of information databases and other sources; analyze and evaluate the patterns and possibilities of chemical processes and energy conversion.	PD
46	Chemometrics	During the course, pre-service teachers develop their knowledge on the basics of chemometrics and multidimensional methods of analysis. They also consider examples of practical tasks. During the course, pre-service teachers master the methods and means of chemometrics for processing chemical analysis data. They also use modern software tools for processing experimental information. Pre-service teachers demonstrating competence can: use knowledge of the basics of chemometrics, a multidimensional analysis method for processing the results of a chemical experiment; apply modern software tools for processing experimental information; interpret the analysis data and evaluate the results of the experiment.	PD
47	CLIL in Chemistry Lessons	During the course, pre-service teachers apply the principles and methods of content and language integrated learning (CLIL). They learn about the general issues of planning and teaching chemistry in English using CLIL as well as the methods of differentiation in content and language integrated chemistry teaching. Pre-service teachers plan and construct lessons using CLIL approach. Pre-service teachers demonstrating competence can: · application of CLIL technology for the organization of classroom management training activities; · develop an integrated lesson plan with an indication of the language and subject competencies being formed; create a safe and supportive learning environment; develop students' reflexive skills in the process of self-assessment of teaching chemistry at school in English; create a collaborative environment for effective interaction of all participants in the organization of educational activities in the chemistry lesson.	PD
48	Design and Data Processing in Chemistry	Pre-service teachers acquire skills in making plans for various types of experiments and master the methods of processing the results of the analysis and decision-making. During the course, pre-service teachers develop their abilities to make a mathematical model of an experiment, to argue the results by statistical processing, and to ensure the representativeness of the experimental data. Pre-service teachers demonstrating competence can: prove the reliability of the experimental results using factor analysis methods; establish causal relationships between the quantitative characteristics of the experimental results; substantiate the confirmation or refutation of the hypothesis of the experiment.	PD
49	Art of Chemical Synthesis	During the course, pre-service teachers improve their practical skills in research activities when performing independent, individual work. They also develop their abilities to plan chemical synthesis, and select methods of separation and purification of substances. Pre-service teachers develop a constructive approach to conducting chemical synthesis in original ways. Pre-service teachers demonstrating competence can: plan and design chemical synthesis in an original way; evaluate the advantages and disadvantages of the synthesis and suggest ways to improve; determine the purity and to argue the characteristics of the resulting product; identify and manage risks during synthesis.	PD

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50	Electrochemistry	electrochemical processes. Pre-service teachers, relying on knowledge from related fields of sciences, study the laws of mutual transformation of chemical and electrical forms of energy and systems, as well as the principles of operation of electrochemical devices and devices. They also construct knowledge on ion systems, processes and phenomena occurring with charged particles at the interface of phases. Pre-service teachers demonstrating competence can: apply knowledge and perform calculations to specific electrochemical processes; understand the principles of operation and work on electrochemical devices and process experimental information; identify patterns of electrochemical processes.	PD
51	STEM Education	During the course, pre-service teachers explore non-traditional application of interdisciplinary knowledge of natural sciences, engineering, technology, and mathematics in any conditions to achieve the best result. During the course, pre-service teachers examine the forms and methods of STEM education, the development and use of heuristic tasks of a natural science nature, and integrated training on cross-cutting topics. They also apply gamification methods, problem-based learning, 3D models, solving case tasks, etc. Pre-service teachers develop their three-dimensional thinking and their abilities to analyze the main problems and contradictions in the implementation of basic STEM learning approaches. Pre-service teachers demonstrating competence can: apply interdisciplinary knowledge of natural sciences, engineering, technology and mathematics to achieve the best result; discuss the technical solution of the task; model the image of future activities (constructive, project, speech, etc.); invent creative ideas (own products: projects, creative inventions, models, games, etc.) mechanisms for their implementation.	PD