

**NON-PROFIT JOINT-STOCK COMPANY
«AL-FARABI KAZAKH NATIONAL UNIVERSITY»**

MODULE HANDBOOK

EDUCATION PROGRAMME

7M01503 - CHEMISTRY

CLUSTER B

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Purpose of education programme	Ошибка! Закладка не определена.
Learning outcomes	Ошибка! Закладка не определена.
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Course structure	Ошибка! Закладка не определена.
List of modules	Ошибка! Закладка не определена.
ELECTIVE COMPONENT	Ошибка! Закладка не определена.
Modern problems of biomedicine	Ошибка! Закладка не определена.
Major Disciplines (MD)	Ошибка! Закладка не определена.
Theoretical Biomedicine	Ошибка! Закладка не определена.
Diagnostic problems	Ошибка! Закладка не определена.
Elective Component (EC).....	Ошибка! Закладка не определена.
Molecular basis of the functioning of the body	Ошибка! Закладка не определена.
REASEARCH	Ошибка! Закладка не определена.

Content

Purpose of education programme

Preparation of masters with extensive fundamental knowledge in the field of chemistry and pedagogy, using modern educational technologies, as well as capable of management activities in the field of science and education.

Learning outcomes

ON1. Have subject knowledge in the field of theoretical positions, technologies, operations, practical methods and techniques for conducting scientific research.

ON2. Interpret and summarize chemical information, including in a foreign language.

ON3. Carry out the selection, structuring and implementation of the content of educational material in chemistry in accordance with the goals and objectives of chemical education, taking into account its most important functions, types and forms of lessons, extracurricular activities and elective classes, as well as the features of the educational institution, educational groups, individual students.

ON4. Apply new educational technologies and teaching methods, with the introduction of innovations in the educational process.

ON5. Apply effective methods and means of managing the quality of educational services, with the identification of defects in the organization related to the quality of educational services.

ON6. Apply main principles of management of educational systems.

ON7. Control and correct the pedagogical process (including self-control and self-correction).

ON8. Increase own professional competence in the field of chemistry.

ON9. Present the results of educational and research activities in the form of scientific reports, abstracts, educational-research and scientific projects.

ON10. Formulate problems and tasks of scientific research in the field of chemistry and educational technologies, with a choice of methods and means of solving the tasks.

ON11. Carry out research experiments in the field of chemistry and adequately interpret obtained results.

ON12. Participate in team work, with the analysis and assessment of work situations to find ways to effectively interact with team members.

Learning Objectives-Module Matrix (матрица целей обучения)

Module (наименование модулей)	Learning outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
Module of history and philosophy of science	+		+	+						+		+
Module of Psychology and Pegagogy		+		+		+				+		+
Module "Current trends in educational and chemistry"	+	+	+	+	+		+		+	+	+	+
Module of methods of teaching chemistry and modern chemistry	+	+	+	+	+	+		+		+	+	+
Module of organization of scientific and pedagogical activity	+	+	+	+	+		+			+	+	+
Module " Legislation in the system of education and science"			+		+	+	+		+			+
Module "Modern trends in chemistry"	+	+						+	+	+	+	
Module "Theoretical and Applied Chemistry"	+	+			+			+	+	+	+	

Course structure

RESEARCH		CORE DISCIPLINES <i>(Базовые дисциплины)</i>		MAJOR DISCIPLINES <i>(Профильные дисциплины)</i>	
UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
		20	15	31	18
24		35		49	

TERM

1	Module on history and philosophy of science 3 ECTS Psychology and Pedagogy Module 6 ECTS 9 ECTS	Current trends in educational and chemistry <i>or</i> Module of methods of teaching chemistry and modern chemistry 6 ECTS	Module of organization of scientific and pedagogical activity 12 ECTS	RES. Master's Student Research (MSR), Including Scientific Internship And Dissertation Writing 3 EC	30
2	Module on history and philosophy of science 6 ECTS Psychology and Pedagogy Module 5 ECTS 11 ECTS	Current trends in educational and chemistry <i>or</i> Module of methods of teaching chemistry and modern chemistry 9 ECTS	Module of organization of scientific and pedagogical activity 6 ECTS	RES. Master's Student Research (MSR), Including Scientific Internship And Dissertat	30

			ion Writing 4 ECTS	
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3	Legislation in the system of education and science 13 ECTS	Modern trends in chemistry Or Theoretical and applied Chemistry 18 ECTS	Ma ste r's Stu de nt Re sea rch (M SR), Inc lud ing Sci ent ifin g Int ern shi p An d Dis ser tati on Wr itin g 2	33

4	RESEARCH Master's Student Research (MSR), Including Scientifying Internship And Dissertation Writing 15 ECTS	FINAL ATTESTATION 12 ECTS	27
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List of modules

Workload HPW (Hours per week) according – Teaching methods as lecture, seminar, lab works and others (lesson, project, etc.)

Module/Disciplines	ECTS	Workload HPW (Часы в неделю)				Term
		lec.	sem.	lab.	other	
Module on history and philosophy of science	9					
History and philosophy of science	3	1	2			1
Foreign Language (professional)	6		6			2
Psychology and Pedagogy Module	11					
Pedagogy of higher education	3	1	2			1
Psychology of management	3	1	2			1
Teaching Internship	5				5	2
Current trends in educational and chemistry	15					
Methods for evaluating learning outcomes	6	3	3			1
Distance learning technologies	9	3	6			2
Module of methods of teaching chemistry and modern chemistry	15					
Modern general chemistry	6	3	3			1
Development of massive open online courses	9	3	6			2
Module of organization of scientific and pedagogical activity	18					
Organization and planning of research	6	3	3			1
Didactic chemistry	6	3	3			1
The methodology of chemical-pedagogical investigations	6	3	3			2
Legislation in the system of education and science	13					
Regulatory framework of the education and science system of the Republic of Kazakhstan	9	3	6			3
Research practice	4				4	3
Modern trends in chemistry	18					
Computer modeling in education and chemistry	9	3	6			3
Green Chemistry	9	3	6			3
Theoretical and applied Chemistry	18					
Methods of solving tasks at the high school chemistry course	9	3	6			3
Modern aspects of applied chemistry	9	3	6			3
MASTER'S STUDENT RESEARCH (MSR), INCLUDING SCIENTIFING INTERNSHIP AND DISSERTATION WRITING	24					
NIRM 1	3	1	1		1	1,2,4
NIRM 2	14	2	3	2	7	1-4

NIRM 3	3				3	4
NIRM 4	4				4	4
FINAL ATTESTATION					12	4
TOTAL	120					

UNIVERSITY COMPONENT

Module on history and philosophy of science

Module Objectives. Students will be able to:

1. develop training materials in accordance with the objectives of the course, plan and organize the independent work of students.
2. to form students' readiness for self-education throughout their lives.
3. have the ability to interact with others in a rational and honest way, including the development of a sense of social responsibility and solidarity, be able to work in a team.
4. to collect, analyze and use chemical materials to study the natural resource potential of the country;
5. to master the patterns and trends in the development of special activities for the production of scientific knowledge, taken in their historical dynamics and considered in a historically changing socio-cultural context;
6. to know the principles of the organization and functioning of science, the genesis and history of science from the point of view of the formation of its models, images and styles of thinking.
7. analyze and comprehend the realities of modern theory and practice based on the history and philosophy of science, methodology of natural science, socio-humanitarian and technical knowledge
8. to apply knowledge of the self-consciousness of science in its socio-philosophical perspectives; the phenomenon of science as a profession, social institution and direct productive force, to reveal the disciplinary self-determination of natural, social and technical sciences, their commonalities and differences.

Module designation	<i>History and philosophy of science</i>
Credit points	3
Semester(s) in which the module is taught	1
Relation to curriculum	CD. Univer component M –1 Module on history and philosophy of science IFN 5201 History and philosophy of science
Teaching methods	Lecture, seminar, practice, project <i>Lectures will</i> a selection from the orientation readings and material for classroom discussion based on their own judgment. It is recommended that students used those texts not selected for classroom discussion as background readings which will help them contextualize the texts which will be subject of discussion (lecture-discussions, lectures with case studies, lecture-study, fluent brainstorming, lecture with the use of feedback techniques, lecture-consultation). <i>The seminars</i> are interactive and allow students to practice their new skills and explore different topics.

Workload (incl. contact hours, self-study hours)	<i>15 weeks, 1 hour per week for Lecture, total 15 Contact hours. 2 hours per week for Seminar, total 30 Contact hours.</i>
Person responsible for the module	<p>Koshkarbayev Yerbolat Senior lecturer of Department of philosophy.</p> <p>Sembaeva Gulnar Malikovna Senior lecturer of Department of philosophy.</p> <p>Boretskiy Oleg Mihailovich Senior lecturer of Department of philosophy</p>
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	<i>Prerequisites:</i> Philosophy, the complex of natural-science and socio-humanistic studies of bachelor course
Module objectives/intended learning outcomes	<p><u>Knowledge base:</u> The purpose of the discipline is to study the complex of problems of science in philosophical knowledge and philosophical research through the presentation of the main directions, approaches, methodology, methods associated with the phenomenon of science, modern science, epistemology, research of science in culture, etc.</p> <p><u>Analysis:</u> critically analyze and evaluate the philosophical concepts of science and the "main" approaches to the "problems" of science in philosophy and philosophy of science.</p> <p><u>Synthesis:</u> can synthesize and transform the philosophical and interdisciplinary knowledge to solve educational and research applications, can use conceptual and methodological apparatus of philosophy and social sciences to solve creative issues of various difficulty levels, using modern computer technologies and interactive teaching methods;</p> <p><u>Evaluation:</u> substantiate and reveal the essence of the philosophy of science in the context of the development of philosophical knowledge and the methodology of philosophical cognition and researches;</p> <p><u>Application:</u> argue their own position and point of view regarding the importance of the diversity of scientific research, as well as approaches to the problems of science;</p> <p><u>Application of skills:</u> can work on educational and research projects to determine the context of the problem, formulate research goals and objectives, substantiate the methodology</p>

	<p>and methods of the project (using modern computer technology, resources, etc.)</p> <p><i>Autonomy in skill use:</i> can plan and implement basic and applied research projects, perform science projects using methods of analysis of social and individual reality and methods of research process of its transformation, present ability of design and carrying out professional, scientific and scientific pedagogical activity, based on the philosophical understanding of modern educational processes.</p>
<p>Content</p>	<ul style="list-style-type: none"> • Introduction to the discipline. The subject of history and philosophy of science. • Science as a subject of philosophy, and a variety of "scientific" and "theoretical" research in philosophy, as well as research of science itself in philosophy. • Classical and modern philosophy of science in the context of studying the problems of science and its evolution: comparisons and evaluations. • Features of science as a social institution. Classical philosophy and philosophy of science: essence, criteria and names. • Historical dynamics of science and its features. • Foundations and possibilities of internalist and externalist approaches and models of the development of scientific knowledge. • Scientific picture of the world and actual problems of science in modern philosophy of science. • The problem of scientific rationality in modern philosophy of science. • Science and methodological knowledge. Science and methodological culture. • The nature and specificity of the scientific revolution. • Theoretical knowledge. • Disciplinary structure of science: philosophical analysis. • Social and humanitarian knowledge and science: evolution, structure, tasks, problems, etc. • Scientific discovery. • Science as the basis for the development and modernization of modern society.
<p>Examination forms <i>(Форма экзамена)</i></p>	<p><i>Written examination: Project work, essey</i></p>

<p>Reading list (список литературы)</p>	<p>Main:</p> <ol style="list-style-type: none"> 1. Mitroshenkov, OA History and Philosophy of Science: textbook for universities / OA Mitroshenkov. - Moscow: Yurayt Publishing House, 2022. - 267 p. (Russian) 2. Franz-Peter Griesmaier, Jeffrey A. Lockwood. This is Philosophy of Science: An Introduction, 2022; 3. Nikiforov, A.L. Philosophy and history of science: Textbook. - Moscow.: Infra-M, 2018. - 384 p. (Russian) 4. Christopher Donohue and Charles T. Wolfe. Vitalism and Its Legacy in Twentieth Century Life Sciences and Philosophy (History, Philosophy and Theory of the Life Sciences, 29): 2022 <p>Recommended:</p> <ol style="list-style-type: none"> 1. Nikiforov, A.L. Philosophy and history of science: Textbook. - Moscow.: Infra-M, 2018. - 384 p. (Russian) 2. Kuzmenko, G.N. Philosophy and Methodology of Science: Textbook for Masters / - Moscow: Yurayt, 2016. - 450 p. (Russian) 3. Myrzaly S.K. History and philosophy of science. - Almaty: Bastau, 2014. (Kazakh) 4. Stepin V.S. History and philosophy of science. – Moscow: Academic Project, 2011. - 423 p. (Russian). 5. Khasanov M.Sh., Petrova V.F. History and philosophy of science. - Almaty: Kazakh University, 2013. - 150 p. (Russian) 6. Ostrovsky E.V. (2012) History and Philosophy of Science. UNITY-DANA, 160 p 7. Cover J.A., Curd M. and Pincock, C. (2012) Philosophy of Science: The Central Issues, 2nd edition. Norton. (English) 8. Mamchur E.A. The future of fundamental science. Conceptual, philosophical and social aspects (2011) URSS, Moscow (Russian)
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Module designation	Foreign Language (Professional)
Credit points	6
Semester(s) in which the module is taught	2
Relation to curriculum	CD. Univer component M –1 Module on history and philosophy of science IYa 5202 Foreign Language (professional)
Teaching methods	Practical lessons (individual, group, project work, discussion, test)

Workload (incl. contact hours, self-study hours)	<i>15 weeks, 4 hours per week for Seminar, total 60 Contact hours.</i>
Person responsible for the module	Makhmetova D. Senior teacher Department of Foreign Languages Lugovskaiya Evgeniya Ivanovna Senior teacher Department of Foreign Languages
Language (язык обучения)	English
Required and recommended prerequisites for joining the module	Prerequisites: intermediate level of English (B1)
Module objectives/intended learning outcomes	<p>Speaking:</p> <ul style="list-style-type: none"> - apply professional vocabulary and terminology necessary for effective communication in a professional environment within the framework of specialty; - think creatively; - be creative in solving new problems and situations; - independently prepare and deliver oral messages on professional topics, including the use of multimedia technologies. <p>Reading:</p> <ul style="list-style-type: none"> - read and translate authentic texts in the specialty from English into native language using a dictionary; - extract the necessary information from English-language sources created in various sign systems (text, table, graph, diagram, audiovisual series, etc.) in typical situations of professional and business communication; - recognize significant information in oral and written utterances, as well as use the basic grammatical units characteristic of technical speech. <p>Writing:</p> <ul style="list-style-type: none"> - to compose written texts of an informative nature (message, report, review, scientific and technical documentation); - abstract of texts on the profile of the specialty, reports of master's students on research topics; - correctly and logically formulate own thoughts in writing. <p>Listening:</p> <ul style="list-style-type: none"> - listen and understand an authentic speech of a general, professional and scientific nature. <p>Prepare presentation material and a project on the topics studied.</p>
Content	<p>UNIT 1 Getting started in research</p> <p>Planning a career in science</p> <p>Applying for research funding</p> <p>Writing up a résumé or CV</p> <p>Preparing for an interview</p> <p>UNIT 2 The scientific community</p> <p>Communicating with scientific communities</p> <p>Writing a critical review</p>

	<p>Completing a Material Transfer Agreement</p> <p>UNIT 3 Finding a direction for your research</p> <p>Doing a literature review</p> <p>Using evidence in arguing a point</p> <p>Taking part in a meeting</p> <p>UNIT 4 Designing an experiment</p> <p>Describing approaches to data collection</p> <p>Designing an experimental set-up</p> <p>Describing material phenomena and forces</p> <p>Making predictions of experimental results</p> <p>UNIT 5 Describing an experiment</p> <p>Describing a process</p> <p>Evaluating the results of an experiment</p> <p>Describing problems with an experiment</p> <p>Keeping a lab notebook</p> <p>UNIT 6 Writing up research 1: materials and methods</p> <p>Describing states and processes</p> <p>Describing data: numbers / numerical values</p> <p>Writing up from lab notes</p> <p>UNIT 7 Writing up research 2: presenting data</p> <p>Analysing data (statistical analysis)</p> <p>Summarising data in visual form</p> <p>Writing captions for figures</p> <p>Describing visual data</p>
<p>Examination forms (Форма экзамена)</p>	<p>Written examination: standard</p>
<p>Reading list (список литературы)</p>	<p>1. Tamzen Armer. Professional English. Cambridge English for Scientists. Cambridge University Press, 2011</p> <p>2. Michael McCarthy, Felicity O'Dell. Academic Vocabulary in Use. Vocabulary reference and practice. Cambridge University Press, 2012</p> <p>3. Cathy Cox and David Hill English for academic purposes. Student's book. Pearson Longman. 2004</p>

Psychology and Pedagogy Module

Module Objectives. Students will be able to:

1. understand the current state of the theory and practice of management psychology in an amount that is optimal for use in the subsequent professional activity;
2. to analyze the methodological problems of the psychological analysis of management processes and phenomena;
3. apply and describe psychological methods of studying individuals and social groups (communities) in order to improve management efficiency;
4. explain the basic psychological characteristics of the activities of individuals and groups that are the objects of management;

5. systematize the basic psychological characteristics of the activities of the subjects of management; establish the nature and content of the psychological preparation of subjects of management;
6. to characterize the socio-psychological phenomena arising in the management process in the interests of increasing its effectiveness;
7. demonstrate methods and techniques for the development and improvement of the professionally important psychological qualities of the subjects of management;
8. develop business and interpersonal skills in the context of the contact of different managerial cultures;

Module designation	Pedagogy of higher education
Credit points	3
Semester(s) in which the module is taught	1
Relation to curriculum	UNIVERSITY COMPONENT M-2 Psychology and Pedagogy Module PVSh 5203 Pedagogy of higher education
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 1 hour per week for Lecture, total 15 Contact hours. 2 hours per week for Seminar, total 30 Contact hours.
Person responsible for the module	Kasymova Roza, PhD Mamyrbekova Gulsan, PhD
Language	Kazakh / Russian
Required and recommended prerequisites for joining the module	Pedagogy Teaching Internship
Module objectives/intended learning outcomes	Students have abilities to analyze of theoretical issues of modern higher school pedagogy; can examine of methodology pedagogy can assess the significance of methodology's approaches, just how people understand and/or learn about pedagogy, given the vast array of ideas, practices, institutions, and communities that lay claim to the category can to apply outcomes of psychological studies in professional and teaching activity
Content	1.The main directions and trends in higher education in the world. Higher Education in the Republic of Kazakhstan. 2.Teaching science and its place in the human sciences. 3.Higher School of Pedagogy Methodology 4.The nature and structure of educational activities 5.Personality of a high school teacher and current requirements for the competence of its 6.Communicative competence of a high school teacher 7.Traditional methods and forms of training 8.The theory of the pedagogical process

	<p>9. Methodological foundations of the learning process in higher education. Managing the learning process</p> <p>10. Active teaching methods to train future specialists</p> <p>11. Active teaching methods to train future specialists</p> <p>12. New educational technologies in higher education</p> <p>13. Organization of the educational process of higher education on the basis of the credit system</p> <p>14. Technology pedagogical planning, organization and control in higher education</p> <p>High school as a social institution.</p>
Examination forms	Written examination: case study
Reading list	<p>1. Geoff Petty. Teaching today. A practical Guide. Fourth Edition. United Kingdom, Nelson Thornes Ltd, 2019. - 614p.</p> <p>2. Mynbaeva A.K., Fundamentals of the Higher School of Pedagogy: Learning PSAR. - Almaty, 2021. - 156p.</p> <p>3. Peonov, P. Pedagogy of higher education. - Minsk University, 2020.</p> <p>Pedagogy and psychology of higher education. - Rostov n/D: Phoenix, 2019. - 544p.</p>

Module designation	Psychology of Management
Credit points	3
Semester(s) in which the module is taught	1
Relation to curriculum	Core disciplines University component
Teaching methods	communication technology; problem learning, critical thinking. Active and interactive forms of training, individual creative and analytical tasks, brainstorming, brainstorming, competition, quiz, decision tasks case; SWOT analysis.
Workload (incl. contact hours, self-study hours)	<p>Total workload: 3 - 190 contact hours</p> <p>15 weeks,</p> <p>1 hour per week for Lecture, total 15 Contact hours.</p> <p>1 hours per week for Seminar, total 15 Contact hours.</p> <p>Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lectures in the form of a mini-conference, video presentations, a traditional lecture and a heuristic conversation, the lecture is an INSERT. Seminars in the form of practical, discussion form, debates and other interactive types.</p> <p>Private study including examination preparation, specified in hours: independent work of a student and independent work under the guidance of a teacher - 60</p>
Person responsible for the module	<p>Sadvakassova Zukhra</p> <p>associated professor of the Department of General and Applied Psychology</p> <p>Zholdassova Manzura</p> <p>Ssenior lecturer of the department of general and applied psychology</p>

Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Prerequisite - Psychology at the Bachelor's degree Postrequisite – Foreign Language (professional)
Module objectives/intended learning outcomes	<p><u>Analysis:</u> carry out psychological analysis of management processes and phenomena; analyze and evaluate communication processes and processes of interpersonal perception in the organization through the application of system analysis and cross-cultural management techniques; Critically analyze the management performance of a manager based on a survey of management styles; analyze the professional activities of the manager in terms of ensuring his psychological effectiveness;</p> <p><u>Synthesis:</u> factors affecting the effectiveness of the group, psychological methods of resolving conflict situations, psychological support for innovations;</p> <p><u>Evaluation:</u> assess life and professional situations from the point of view of management psychology; Assess occupational risks in various management activities;</p> <p><u>Application:</u></p> <ul style="list-style-type: none"> - interpret the processes of interpersonal perception, interpersonal and intercultural communication in the organization to maintain the corporate culture and psychological climate; - apply psychological technologies to regulation of emotional state, stress tolerance, personal growth, reduction of management conflicts, improvement of psychological climate and corporate culture; - apply skills of psychological selection of personnel, management decisions, methods of motivation of work; managing the organization's emotional environment
Content	<p>Lecture 1. Introduction to management psychology</p> <p>Lecture 2. History of management psychology development</p> <p>Lecture 3. Theoretical and methodological foundations of management psychology.</p> <p>Lecture 4. Research methods in management psychology</p> <p>Lecture 5. Personality in management interaction</p> <p>Lecture 6. The identity of the leader as a subject of organization management.</p> <p>Lecture 7. Psychology of management decisions.</p> <p>Lecture 8. Motivational aspects of management.</p> <p>Lecture 9. Personality and building a business career in the organization.</p> <p>Lecture 10. Psychology of business communication and professional communication.</p> <p>Lecture 11. Psychology of interpersonal perception in the organization.</p> <p>Lecture 12. Psychology of intercultural communication.</p> <p>Lecture 13. Emotional management.</p> <p>Lecture 14. Psychology of management conflicts.</p> <p>Lecture 15. Corporate culture of the organization</p>
Examination forms	The form of the exam is written - the solution of cases - grouped by the topic of situational and problematic problems. Case topics: 1. The identity of the manager.

	<p>2. Personality and business career</p> <p>3. Interpersonal and intercultural communication in the organization.</p> <p>4. Stereotypes of perception in the organization.</p> <p>5. Employee motivation problems.</p> <p>6. Management decision-making.</p> <p>7. Communicative barriers to business communication.</p> <p>8. Management conflicts.</p>
Reading list	<p>1. Akhtaeva N.S., Abdizhapparova A.I., Bekbaeva Z.N. Baskaru pshihologiya. - Almaty: Kazakh University, 2018. - 452 p.</p> <p>2. Irgebayeva N.M. Baskaru pshihologiya. [Electronic resource]: textbook/Irgebayeva N.M. - Electronic text data. - Almaty: Nur-Print, 2015.- 356 p. - Access mode: http://www.iprbookshop.ru/67021.html. - EBS "IPRbooks"</p> <p>3. Korolev L.M. Pshihologiya upravleniya. 5th ed. - M.Dashkov and K., 2016. - 188 p.</p> <p>4. Umbitaliyev A.D. Baskaru pshihologiya: textbook/A.D. Umbitaliyev, K.B. Satymbekova, G.E. Kerimbek/Almaty: Economics, 2017. - 464 p.</p> <p>5. Gilbreth L.M. The Psychology of Management. Palala Press, 2015 - 360 p.</p> <p>6. Voskoboynikov F. The Psychology of Effective Management. Strategies for Relationship Building, Taylor & Francis eBooks, 2016 – 174 p.</p> <p>7. Shane Linder. Project Management & Business Psychology: A Guide to Construction Management, 2020.</p> <p>8. James P Armatas. Management Practices of Successful CEOs: Memoir of a Psychological Consultant to Management, 2020.</p>

Module designation	Teaching Internship
Credit points	5
Semester(s) in which the module is taught	2
Relation to curriculum	UNIVERSITY COMPONENT PRACTICE
Teaching methods	-
Workload (incl. contact hours, self-study hours)	-
Person responsible for the module	Matveeva Ilona Valeryevna Associate Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian
Required and recommended prerequisites for joining the module	Before teaching practice, undergraduates study the following disciplines: «Pedagogy of higher education», «Psychology of Management»

<p>Module objectives/intended learning outcomes</p>	<p>The purpose of the pedagogical practice of magistracy studies is to prepare for scientific and pedagogical activities in a higher educational institution, to acquire and consolidate the skills of practical exercises for the implementation of the educational process in higher education, including the teaching of particular disciplines, the organization of educational activities of students, scientific and methodological work on the subject. In addition in the course of teaching practice, a master's student should expand and deepen theoretical knowledge:</p> <ul style="list-style-type: none"> - basic principles, methods and forms of organization of the pedagogical process; - methods of control and evaluation of professionally significant qualities students; - requirements for a university teacher in modern conditions. - implementation of methodological work on the design and organization of the educational process; - speaking in front of an audience and creating a creative atmosphere in the course of classes; - analysis of difficulties arising in pedagogical activity and the adoption of an action plan to resolve them; - independent conduct of psychological and pedagogical research; - self-control and self-assessment of the process and result of pedagogical activity. - correct diagnosis of the pedagogical phenomenon; - skills are associated not only with the direct presentation of educational information but also with the methods of obtaining and processing it. - independently conduct classes according to the plan of the academic discipline (at least two lessons); - develop lecture notes for individual academic disciplines (at least one abstract); - form a methodological package for the chosen academic discipline; - accessible, taking into account the specifics of the subject, the level of preparedness of students, their life experience and age to present educational material; - using various teaching methods and their combinations, it is logically correct to build the process of teaching and learning information by students; - to formulate questions in an accessible, concise and expressive way; - effectively use technical training aids, visual aids, computer programs; - promptly diagnose the nature and level of learning by students of educational material;
<p>Content</p>	<p>-</p>
<p>Examination forms</p>	<p>The student-trainee draws up the practice results in a written report, which he defends in the commission at the graduating department during the corresponding period of intermediate certification according to the academic calendar. The assessment of the student's internship results is equated to the theoretical training marks, is taken into account when considering the issue of awarding a scholarship, and when calculating the overall GPA and transferring it to the next year</p>

	of study and entered in the statement of practice. The general results of the practice summarise at the Academic Councils of the faculties with the participation of representatives of the practice bases. The final grade for pedagogical practice gets rated by a commission, which includes teachers in pedagogy and psychology and the head of training from the graduating department.
Reading list	<ol style="list-style-type: none"> 1. Afonin, I.D. Psychology and Pedagogy of Higher School / I.D. Afonin, A.I. Afonin. - M.: Rusayns, 2018. - 256 p. 2. Gromkova, M.T. Pedagogy of Higher School: Textbook / M.T. Gromkov. - M.: Unity, 2017. - 80 p. 3. Mukasheva A.B., Kasen G.A. Pedagogical practice in magistracy: guidelines. - Almaty: Kazakh University, 2011. - 84 p. 4. Okolelov, O.P. Pedagogy of Higher School: Textbook / O.P. Okolelov. - M.: Infra-M, 2016. - 219 p. 5. Stolyarenko, L.D. Psychology and Pedagogy of Higher School: Textbook / L.D. Stolyarenko. - Rn / D: Phoenix, 2014. - 336 p.

ELECTIVE COMPONENT

Current trends in educational and chemistry

Module Objectives. Students will be able to:

1. formulate the problems and tasks of scientific research in the field of green chemistry, with the choice of methods and means for solving the tasks;
2. explain the principles of using big data in pedagogy;
3. characterize the role of chemistry in the concept of sustainable development;
4. critically evaluate the results of scientific research in the field of chemistry and pedagogy;
5. use computer simulation in pedagogical research, as well as to predict the reactivity of chemicals;
6. analyze structured and unstructured data of large volumes about students and the educational environment;
7. develop methods for describing and modeling the educational process, means for modeling the educational process;
8. introduce innovations in the educational process, using new educational technologies and teaching methods.

Module designation	Methods for evaluating learning outcomes
Credit points	6
Semester(s) in which the module is taught	1
Relation to curriculum	<p>CD. Elective component.</p> <p>M-3 Current trends in educational and chemistry</p> <p>MORO 5206 Methods for evaluating learning outcomes</p>
Teaching methods	lecture, seminar

Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 2 hour per week for Seminar, total 30 Contact hours;
Person responsible for the module	Yarovaya Yelena Yuriyevna, Senior Lecturer of Department of General and Inorganic Chemistry Abisheva Aigul Kadirbekovna Associate Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Theoretical and practical pedagogy, Pedagogical anthropology
Module objectives/intended learning outcomes	- description of theoretical, practical and psychological aspects of the assessment process in modern education, - analyzing innovations in the system of assessment of results, - ability to characterize functions, types, forms and means of control in education; - ability to systematize technologies of application of modern means of estimation, - ability to interpret the methodological and theoretical foundations of the organization of the current and final control of knowledge.
Content	Lectures: Comprehensive assessment of subject, metasubject, personal results. Tiered approach in presentation of the results and their evaluation. Evaluation method "addition"; storage system evaluation of individual achievements. Combination of internal and external evaluation; inclusion in valuation activities the students themselves. Usage

	<p>standardized assessment methods Testing, (oral and written works) and non-standardized methods (projects, creative work, introspection, self- and mutual assessments, observations). The use of personalized and non-personalized information. Interpretation of results based on contextual information about conditions implementation of educational programs. Accumulated score – Portfolio, Evaluation sheets, Observation sheets. Grading alternation through subtraction and addition. The use of various types of incentives. Co-management of the assessment process for based on self-assessment, mutual assessment through "Magic Lines" self-assessment based Portfolio of Achievements. Types, forms of assessment. Unmarked education. Diagnostics of personal subject, meta-subject achievements of students.</p>
<p>Examination forms</p>	<p>Written examination.</p> <p>Example of exam question:</p> <ol style="list-style-type: none"> 1. Analyze the combination of internal and external evaluation; inclusion in valuation activities the students themselves. 2. Describe the use of standardized assessment methods. 3. Describe the use of non-standardized assessment methods. 4. Describe the use of personalized and non-personalized information. Give an example 5. Provide an interpretation of the results based on contextual information about the conditions implementation of educational programs.
<p>Reading list</p>	<ol style="list-style-type: none"> 1. Baranova, O. I (KubGU). Formation of the evaluation activity of junior schoolchildren (technological map) [Text]: teaching aid / O. I. Baranova; Ministry of Education and Science Rus. Federation, Kuban State. un-t. - Krasnodar: [Kuban State University], 2010. - 46 p. 49 copies (in russian) 2. Borytko N.M. Diagnostic activity of the teacher: textbook. allowance for students. higher textbook institutions / N.M. Borytko. / Ed. V.A. Slastenina, I.A. Kolesnikova. M.: Publishing Center "Academy", 2006. 288 p. 12 copies (in russian)

	<p>3. Maksimov V.G. Pedagogical diagnostics at school: Proc. allowance for students. higher ped. education, institutions. - M.: Publishing Center "Academy", 2002. - 270 p. 38 copies (in russian)</p> <p>4. Evaluation of the achievement of planned results in primary school. Job system. Part 1. Under. Ed. G.S. Kovaleva, O.B. Loginova. - M.: Enlightenment, 2011. - 215 p. (Standards of the second generation). 6 copies (in russian)</p>
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Module designation	Distance learning technologies
Credit points	9
Semester(s) in which the module is taught	2
Relation to curriculum	CD Elective component M -3 Current trends in educational and chemistry DTO 5207
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 4 hour per week for Seminar, total 60 Contact hours
Person responsible for the module	Abisheva Aigul Kadirbekovna Associate Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	methods of teaching chemistry, didactics of chemistry
Module objectives/intended learning outcomes	- order description of application of distance learning technologies in the educational process, their role, place and conditions of effective application; - ability to characterize the basic concepts used in distance education, their relationship; prospects for the development of distance education,

	<ul style="list-style-type: none"> - demonstration of the use of effective distance learning technologies for the organization of the educational process and management of master degree students activity; - evaluation of the didactic properties of the telecommunication information and educational environment, the structural elements of the distance learning course typical for use in distance education, the order of its development, the criteria for its evaluation; - ability to develop ways to reduce costs and improve learning effectiveness.
Content	<p>Lecture</p> <p>Distance learning technology. Innovation of the modern education system. Methodology of teaching in distance education (ED) as a science and educational subject. Goals and objectives of teaching chemistry. The language of chemistry in distance learning is a cognitive tool in teaching chemistry. Sorting methods of teaching chemistry by distance learning technology. Checking the knowledge and skills of students on distance learning technology. The content of the daily plan for distance learning technology. Elective courses of chemistry. Objectives and materials included in the development of a teaching-methodical complex on the subject of chemistry teaching methodology for the specialty "Chemistry" by distance learning technology. Analysis of structural and content features in teaching-methodological complexes of analytical chemistry at universities. Optimizing modern self-work in teaching chemistry by distance learning technology. Methodological bases of formation of chemical concepts by distance learning technology. The importance of democratization in the teaching of chemistry by distance learning technology. Importance of creating content of general education in chemistry by distance learning technology. Topical problems of education in chemistry by distance learning technology. Use of modern technologies in the chemistry lesson on distance learning technology.</p>
Examination forms	<p>Written examination.</p> <p>Example of exam question:</p> <ol style="list-style-type: none"> 1. Describe didactic conditions for educational materials and teaching methods based on the improvement of distance learning technology. 2. To characterize Kazakh and international documents defining the content of education, and to show the main features of the state and public management of the education system. 3. Formulate the necessity of using innovative technology in a virtual chemical experiment based on the technology of distance learning.
Reading list	<p>1. Software for computer networks: Textbook /O.V. Isachenko. - M.: INFRA-M, 2012. - 117 p.</p>

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| | <p>2. Fedotova E.L. Information technologies in science and education: Textbook / E.L. Fedotova, A.A. Fedotov. - M.: ID FORUM: INFRA-M, 2011. - 336 p.</p> <p>3. Trainev, V. A. New information and communication technologies in education / V. A. Trainev, V. Yu. Teplyshev, I. V. Trainev. - 2nd ed. - M.: Publishing and Trade Corporation "Dashkov and K-", 2013. - 320 p.</p> |
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Module of methods of teaching chemistry and modern chemistry

Module Objectives. Students will be able to:

1. formulate the problems and tasks of scientific research in the field of green chemistry, with the choice of methods and means for solving the tasks;
2. explain the principles of using big data in pedagogy;
3. characterize the role of chemistry in the concept of sustainable development;
4. critically evaluate the results of scientific research in the field of chemistry and pedagogy;
5. use computer simulation in pedagogical research, as well as to predict the reactivity of chemicals;
6. analyze structured and unstructured data of large volumes about students and the educational environment;
7. develop methods for describing and modeling the educational process, means for modeling the educational process;
8. introduce innovations in the educational process, using new educational technologies and teaching methods.

Module designation	Modern general chemistry
Credit points	6
Semester(s) in which the module is taught	1
Relation to curriculum	CD. Elective component. M-6 Module of methods of teaching chemistry and modern chemistry SOH 5206 Modern general chemistry
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 2 hour per week for Seminar, total 30 Contact hours.
Person responsible for the module	Bekishev Kurmangali Batyrbekovich Associate Professor of the Department of General and Inorganic Chemistry Matveeva Ilona Valeryevna Associate Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Inorganic chemistry, Analytical chemistry, Physical chemistry

Module objectives/intended learning outcomes	<ul style="list-style-type: none"> - description of the properties of simple and complex substances based on the electronic structure of their atoms and the position in the Periodic table of chemical elements with using modern methods; - formulation of the concept of the chemical process on the basis of the fundamental laws and laws of chemical thermodynamics and kinetics; - demonstration of modern theoretical foundations of General chemistry based on intellectual and experimental skills of working with chemicals; - using of methods of critical analysis and development of theories in professional activity; - interpretation of the kinetic and thermodynamic patterns of chemical processes.
Content	<p>Lecture</p> <p>The atom is a molecular doctrine. The Basic Laws of chemistry characteristics. The concept of equivalent is based on the current IUPAC statement. The law of equivalents. Atomic structure and the periodic table. Modern theories of chemical bonding. Prediction of The Shape of molecules in space according to the theory of VSEIT (R. Gillespie). Theory of molecular orbitals. Ionic, metallic and hydrogen bonds. Intermolecular interactions. Fundamentals of chemical Thermodynamics. Fundamentals of chemical thermodynamics (entropy, Gibbs energy) prediction of the direction of a chemical reaction according to thermodynamic data. Modern theories of chemical kinetics. Chemical equilibrium. The principle of Le Chatelier-Braun and its application in practice. Fundamentals of the doctrine of solutions. Methods for describing the composition of solutions. Colligative properties of liquefied solutions (osmosis, etc.). Vanth-Goff and Raoul's laws. Modern theories about the nature of electrolyte solutions. Ionic balances in aqueous solutions (ph, EC, hydrolysis). The redox process is the quantitative characteristics of the skin. Sep row and practical conclusions from it. Latimer and Frost diagrams. Electrolysis. Prediction of the direction of a chemical reaction by electrochemical data. (A series of standard electrode potentials and practical conclusions from it.). Modern Theo-RIAs explaining the properties of complex compounds. Theories of the crystal field, the field of ligands, etc.</p>
Examination forms	<p>Written examination.</p> <p>Example of exam question:</p> <p>1 Analyze the principles of filling the orbitals of multi-electron atoms with electrons. Give the definitions of the minimum energy principle, Pauli's principle and Hund's rule and examples of their application. Using klechkovsky's rules and the above principles,</p>

	<p>give an example(s) of filling the orbitals of multi-electron atoms. Write down the electronic formula of the element taken as an example.</p> <p>2 How do the bond lengths, dissociation energy, magnetic properties of particles change in the series O_2^{2-} - O_2^- - O_2 - O_2^+? Justify your answers by drawing energy diagrams of these particles using the method of molecular orbitals.</p> <p>3 4.57 g of sucrose ($C_{12}H_{22}O_{11}$) is dissolved in water with a mass of 100 g. It is necessary to find: a) the osmosis pressure of the solution at 293 K; B) the crystallization temperature of the solution; C) the boiling point of the solution; D) the saturated vapor pressure on the surface of the solution at 293 K. The saturated vapor pressure on the surface of pure water at 293 K is 2.337 KPA (17.53 mm.criticism.GG.). Consider that the density of the solute is equal to the density of water.</p>
Reading list	<p>1. Housecroft K., Constable E. Modern course of general chemistry. In 2 volumes. – M.: Mir, 2014. -540. - T.1. 540 s; T.2. 528 p.</p> <p>2. Housecroft K., Constable E. Modern course of general chemistry. Task book. -M.: Mir, 2014. - 250 p.</p> <p>3. Karapetyants M.Kh., Drakin S.I. General and inorganic chemistry. – M.: LIBROKOM, 2015. -592 p.</p> <p>4. Bekishev K. Chemistry problems. - Almaty: Kazakh University, 2017. - 223 p.</p>

Module designation	Development of massive open online courses
Credit points	9
Semester(s) in which the module is taught	2
Relation to curriculum	<p>CD. Elective component.</p> <p>M-3 Module of methods of teaching chemistry and modern chemistry</p> <p>RMOOK 5207 Development of massive open online courses</p>
Teaching methods	lecture, seminar, practice
Workload (incl. contact hours, self-study hours)	<p>15 weeks,</p> <p>2 hour per week for Lecture, total 30 Contact hours;</p> <p>4 hour per week for Seminar, total 60 Contact hours.</p>
Person responsible for the module	<p>Abishev Talgat Bulatovich,</p> <p>Senior Lecturer of Department of General and Inorganic Chemistry</p>

	<p>Satybaldiev Bagdat</p> <p>Senior Lecturer of Department of General and Inorganic Chemistry</p>
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Educational technologies, Distance learning, Methods for evaluating learning outcomes
Module objectives/intended learning outcomes	<p>ability of explaining the features of the largest online learning platforms;</p> <ul style="list-style-type: none"> - ability to analyze current trends in the development of mass open online courses; - development of different types of tests and tasks to evaluate learning outcomes; - creation of content for massive open online courses; - critical evaluation of the advantages and disadvantages of existing online learning platforms.
Content	<p>Lecture</p> <p>External organization of very open online courses, target audience of mass open online courses, stages of creating mass open online courses, content development, educational video production, content placement on mass open online courses platforms.</p> <p>The history of the development of Massive Open Online Courses. Modern methods for creating MOOCs. The difference between MOOC and other online courses, as well as traditional ways of getting education. Advantages of online learning and MOOCs. Interactivity and communities in the creation of MOOCs. Feedback and evaluation. Structured presentation of material. Blended online learning system. Disadvantages of online learning and MOOCs. Features when creating a massive open online course. Topical issues in the development and launch of the MEP. New opportunities for MOOC. Resources used in the creation of the MOOC.</p>
Examination forms	<p>Written examination.</p> <p>Example of exam question:</p> <ol style="list-style-type: none"> 1. Describe contents of development and maintenance works

	<p>open online course in MOOC format.</p> <ol style="list-style-type: none"> 2. Compare the pros and cons of online learning and MOOCs. 3. Describe the difference between MOOCs and other online courses, as well as traditional ways of getting an education. 4. Give examples of how MOOCs can be used 5. Develop the scenario of the promotional video (promovideo). 6. Develop a short structure for an online course
Reading list	<ol style="list-style-type: none"> 1. Kaplan, Andreas M.; Haenlein, Michael. Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster (АНГЛ.) // Business Horizons : journal. — 2016. — Vol. 59, no. 4. — P. 441—450. 2. MOOCs and Open Education Around the World. Edited by Curtis J. Bonk, Mimi M. Lee, Thomas C. Reeves, Thomas H. Reynolds. First published 2015 by Routledge. 3. Massive Open Online Courses: The MOOC Revolution 1st Edition by Paul Kim, Published November 27, 2014 by NY: Routledge, 176 Pages.

Major Disciplines (MD)

Module of organization of scientific and pedagogical activity

Module Objectives. Students will be able to:

- describe the state educational standards of the new generation, modern educational paradigms and trends in the further development of the theory and practice of chemistry education;
2. formulate the tasks of scientific research in the field of chemistry and pedagogy;
3. explain the basic principles of organization and implementation of scientific research and teaching activities;
4. use the methods of statistical processing of the results of scientific research in chemistry and pedagogy;

5. plan scientific and educational work, carry out various control of knowledge, develop and educate students;
6. present the results of scientific and scientific-pedagogical activities in the form of scientific reports, abstracts, educational research and scientific projects;
7. evaluate the methodology of competence-based and system-activity approaches, basic and chemical-pedagogical competencies;
8. carry out the selection, structuring and implementation of the content of educational material in chemistry and pedagogy in accordance with the goals and objectives of chemical education, taking into account its most important functions, types and forms of classes.

Module designation	Organization and planning of research
Credit points	6
Semester(s) in which the module is taught	1
Relation to curriculum	(MD). UNIVERSITY COMPONENT M-4. Module of organization of scientific and pedagogical activity OPNI 5301. Organization and planning of research
Teaching methods	lectures, seminars
Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 2 hour per week for Seminar, total 30 Contact hours.
Person responsible for the module	Tazhibayeva Sagdat Mederbekovna, Professor of the Department of Analytical, Colloid Chemistry and Technology of Rare Elements
Language	English
Required and recommended prerequisites for joining the module	Physical chemistry, Inorganic Chemistry, Organic Chemistry
Module objectives/intended learning outcomes	-Use the main provisions of the Law on Science of the Republic of Kazakhstan for the development of their research and commercialization of research; -Publish scientific results within the rules of preparation and review of scientific publications; - Own by the methods of protection of intellectual property; -Develop international cooperation in science.

<p>Content</p>	<p>Features of the research organization at the Faculty of Chemistry and Chemical Technology: the main research areas of the departments. The main directions of scientific research institutes. The functions of the Techno Park. Preparation of research projects. Examination of scientific research projects. Students' contribution into research projects. Law of the Republic of Kazakhstan on Science. Scientific activity of higher education institutions. Social security of scientific personnel, their motivation. Financing of scientific and scientific-technical activities. Development of innovative research. International cooperation in the development of science. International grants and funds. Features of the organization of scientific research in the developed countries of the far abroad. Scientific dissertation requirements. PhD- dissertations, master's dissertations: approbation of research results. Hypothesis and general positions of dissertations. Publication of research results. Rating of scientific journals. Citation index. Determination of Hirsch' index. Web of Science, Scopus, Elsevier databases. Intellectual properties and their protection. Functions of authorship rights institutions. Patents and patent law. Copyright certificates, inventions, innovations. The development of cross-sectoral research. Integration of chemistry, biology, medicine, physics, and mathematics specialists, and its results. Priorities in the field of biotechnology. Functions of research institutes. Ways to assess them.</p>
<p>Examination forms</p>	<p>Oral examination. Answers to theoretical and practical questions. The answers should be independent and creative. Plagiarism, forgery of documents, the use of cheat sheets, cheating at all stages of control are unacceptable.</p>
<p>Reading list</p>	<ol style="list-style-type: none"> 1. Law of the Republic Of Kazakhstan About the science, №407-IV, 18.02.2011. 2. Intellectual properties legislation. Laws of the Republic of Kazakhstan "On Copyright and Related Rights", "On the Protection of Breeding Achievements", July 13, 1999. 3. Arveson Paul. <u>Strategic Management of Scientific Research Organizations.2012. V.98-3. www.washacadsci</u> 4. Regulations for master's thesis. KazNU, 2011. Приказ №5 от 21.06.2011. 5. Dunchenko N.I. Fundamentals of scientific research: textbook / N.I. Dunchenko, A.V. Berdutina, V.S. Yankovskaya. – M.: MGUPB, 2009. – 289p. (in russian) 6. Bulletin of KazNU №2(67) 2012. 7. Internet-sites:www.kazpatent.kz; www.findpatent.ru

Module designation	Didactic chemistry
Credit points	6
Semester(s) in which the module is taught	1
Relation to curriculum	MD University component M-4 Module of organization of scientific and pedagogical activity DH 5302 Didactic chemistry
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 2 hour per week for Seminar, total 30 Contact hours
Person responsible for the module	Abisheva Aigul Kadirbekovna Associate Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	pedagogy, history of pedagogy, psychology, ethnopedagogy
Module objectives/intended learning outcomes	- description of the state educational standards of the new generation, modern educational paradigms and trends in the further development of the theory and practice of chemical education; - planning of educational work, carrying out various control of knowledge, implementation of the development and education of the master degree; - evaluation of the methodology of competence and system-activity approaches, basic and chemical-pedagogical competences; - ability to select, structure and implement the content of educational material in chemistry in accordance with the goals

	<p>and objectives of chemical education, taking into account its most important functions, types and forms of training;</p> <p>- ability to analyze and apply methodologies, theoretical and humanitarian-technological bases of modern chemical and chemical-pedagogical education in secondary and higher education.</p>
Content	<p>Lecture</p> <p>Didactics of chemistry as a science and academic discipline. Methods of teaching chemistry as a subject and its scientific foundations. Chemical education as a didactic system. Methodological foundations of chemistry. Methods of chemical education. Preparation of a demonstration experiment. Preparation of laboratory experiments. Preparation of a practical lesson. Methods of chemical experiment. Illustrative methodology. Chemical language as a specific means of teaching chemistry. Organization and management in teaching chemistry. The quality of chemical education: control, evaluation. Didactic experiment in teaching chemistry. Goals, objectives, meaning and content of monitoring the results of teaching chemistry. Forms, types and methods of monitoring the results of teaching chemistry. Application of modern computer technologies in the study of chemistry. Relationship between chemistry and life. Teaching methodology. The concept of the innovation process in education. Essence, driving forces, contradiction and logic of the innovation process in education.</p>
Examination forms	<p>Written examination.</p> <p>Example of exam question:</p> <ol style="list-style-type: none"> 1. Describe the signs of similarities and differences between science and the academic discipline "Didactics of Chemistry", indicating their scientific and educational knowledge. 2. The presence of knowledge in pedagogy, the presence of an understanding of the features of the technological component of chemical education: stimulation-motivational, content-information, operational-activity, value-oriented, organizational and managerial, innovative. 3. Activation of mental activity of students in chemistry lessons in high school.

	<p>English</p> <p>4. Educational chemical experiment as a specific method and means of teaching. Functions of educational chemical experiment and its purpose.</p> <p>5. Organizational forms of teaching chemistry, their brief description. Lessons, electives, extra classes, excursions.</p>
Reading list	<p>1. Chernobelskaya, G.M. Methods of teaching chemistry in high school: Proc. for stud. higher textbook education / G.M. Chernobelskaya. – M.: Humanit. ed. center VLADOS, 2010.</p> <p>2. Programs for educational institutions: Chemistry. Grades 8-11 Comp. N.I. Gabruseva, S.V. Sumatokhin. – M.: Bustard, 2001.</p> <p>3. Kachalova, G.S. Chemistry - 8: Educational and methodological complex for the course of chemistry for grade VIII / G.S. Kachalova, A.M. Kim, L.L. Kuular. - Novosibirsk: Sib. univ. publishing house, 2002.</p> <p>4. Kachalova, G. S. Methods of formation of basic competence of students in organic chemistry: monograph / G. S. Kachalova. - Novosibirsk: Ed. NGPU, 2012. - 206 p.</p> <p>5. Kachalova G.V. C. Methods of studying the main issues of the course of chemistry of the 8th grade: a textbook by G. S. Kachalova. - Novosibirsk: Ed. NGPU, 2009. - 282 p.</p>

Module designation	Methodology of chemical and pedagogical research
Credit points	6
Semester(s) in which the module is taught	2
Relation to curriculum	<p>MD. University component.</p> <p>M-4 Module of organization of scientific and pedagogical activity</p> <p>MHPI 5303 Methodology of chemical and pedagogical research</p>
Teaching methods	lecture, practice
Workload (incl. contact hours, self-study hours)	15 weeks,

	<p>2 hour per week for Lecture, total 30 Contact hours.</p> <p>2 hour per week for Practice, total 30 Contact hours.</p>
Person responsible for the module	<p>Bekishev Kurmangali,</p> <p>Associate Professor of Department of General and Inorganic chemistry</p> <p>Nursapina Nurgul</p> <p>Teacher of the Department of General and Inorganic Chemistry</p>
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Mathematics, physics, and chemistry as part of The Bachelor's program.
Module objectives/intended learning outcomes	<ul style="list-style-type: none"> - understand the structure and methodological principles of scientific and pedagogical research; - understand the meaning of methodological characteristics of chemical and pedagogical research and can describe it; - apply the theoretical knowledge gained during the course to own research; - analyse the information collected as a result of their own research or from the literature review; - solve problems of scientific research based on theoretical knowledge.
Content	<p>Lecture</p> <p>Main types of scientific research. General structure of scientific research. Scientific and methodological apparatus of master's these characteristics as parts of the structure. Methodology for substantiating the novelty of scientific research. Identify the contradictions that cause the novelty of scientific research, choosing of the topic of the dissertation and formulation of the title. Definition of the object and subject of scientific research. Formulate the purpose, hypothesis, and main problems of scientific research. Selection of scientific research methodology. Formulate the novelty of the results of scientific research. Formulate the practical significance of the results of scientific research. Methodology of literature review on the</p>

	<p>topic of scientific research. Problems of compiling the main part of the dissertation. Methodology for conducting a didactic experiment and processing its results. Problems of summing up and publishing the results of the dissertation work. Problems of summing up and publishing the results of the dissertation work. Methodological guidelines related to the dissertation defence procedure. Principles applied for defence of the master thesis.</p>
<p>Examination forms</p>	<p>Written examination.</p> <p>Example of exam question:</p> <p>1 Explain the features of fundamental and applied scientific research using the example of chemistry and pedagogy. Indicate their difference from "assembly" ("razrabotka"). What type of research do your research refer to?</p> <p>2 Justify the relevance of the topic of your master's thesis and show its relationship with strategic programs for the development of the state and programs for the development of the education system of the Republic of Kazakhstan.</p> <p>3 How do you understand the concepts of "research purpose" and "research problems" (objectives)? Explain their connection and differences. Formulate and justify the "research goal" and "research problems" (objectives) of your master's thesis.</p> <p>4 What is an elective course? What are they for? What elective courses on chemistry would you recommend to students of Kazakhstan secondary school? Explain the reasons.</p>
<p>Reading list</p>	<p>1. Starichenko B.E., Semenova I.N., Slepukhin A.V. Designing a dissertation of the Master of Education. – St. Petersburg: Lan, 2016. – 208 p.</p> <p>2. Korzhuev A.V., Popkov V.A. Scientific research in pedagogy: theory, methodology, practice. – M.: Academic project; Triksta, 2008. – 287 p.</p> <p>3. Kuzin F.A. Master's thesis. Methods of writing, rules of registration and protection. – M.: Os-89, 2011. - 224 p.</p> <p>4. Novikov A.M. How to work on a dissertation. Handbook of a novice teacher-researcher. – M.: Egves, 2003.</p>

	5. Pak M.S. Didactics of chemistry. – M.: VLADOS, 2004. – 2004. – 315 p.
	6. Wheelan Ch. Naked statistics. – M.: Mann, Ivanov and Ferber, 2016. – 347 p.

Legislation in the system of education and science

<p>Module Objectives. Students will be able to:</p> <ol style="list-style-type: none"> 1. characterize the current norms of the legislation of the Republic of Kazakhstan and international legal acts regulating the system of education and science; 2. evaluate the regulatory framework of the education and science system of the Republic of Kazakhstan for work in the legal educational space; 3. apply effective methods and means of managing the quality of educational services, with the identification of defects in the organization related to the quality of educational services; 4. apply the basic principles of educational systems management; 5. use the existing regulatory and legal framework for the implementation of activities in the field of education, taking into account international legislation, as well as the legislative framework of the Republic of Kazakhstan; 6. demonstrate an understanding of modern ideas about the education quality management system in institutions; 7. develop and improve proposals for quality management in educational and scientific organizations; 8. demonstrate practical skills and abilities to determine the content, methods and optimal structural and organizational forms of the professional activities of teachers in educational institutions in the implementation of educational programs.

Module designation	Regulatory framework of the education and science system of the Republic of Kazakhstan
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	<p>CD. UNIVERSITY COMPONENT</p> <p>M- 5 Legislation in the system of education and science activity</p> <p>NPBSON RK 6304 Regulatory framework of the education and science system of the Republic of Kazakhstan</p>
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	<p>15 weeks,</p> <p>2 hour per week for Lecture, total 30 Contact hours;</p>

	4 hour per week for Seminar, total 60 Contact hours.
Person responsible for the module	Nazarkulova Sholpan Nurlanovna, Senior Lecturer of Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	not available
Module objectives/intended learning outcomes	<ul style="list-style-type: none"> - Describe the organizational foundations and structures of education management. - Characterize the current norms of the legislation of the Republic of Kazakhstan and international legal acts regulating the education system - Apply the norms of the legislation of the Republic of Kazakhstan in the process of further study and work - Classification the mechanisms and procedures for managing the quality of education - Evaluation the regulatory framework of the education system of the Republic of Kazakhstan for work in the legal educational space

<p>Content</p>	<p>Lecture</p> <p>State policy in the field of education. The education system of the Republic of Kazakhstan. The system of legal relations in the field of education. Methods and principles of regulation of legal relations in the field of education. The competence of regional public authorities that manage education. Local self-government bodies in the field of education. The concept of an educational institution. Types and species of educational institutions. The procedure for creating, reorganizing, and liquidating an educational institution. Licensing and accreditation of an educational institution. The structural subdivision of an educational institution and its legal status. Rights and obligations of an educational institution for the provision of educational services. The rights of the child and their legal protection in the legislation of the Republic of Kazakhstan. Creation and adoption of the UN Convention on the Rights of the Child. Pupils and their legal status: general characteristics. The legal status of pupils in preschool and general education educational institutions. Preschool education institution as a legal entity: organization procedure. Types of organization of preschool education. Licensing and accreditation. The legal relationship between the founder and the educational organization. Responsibility of the preschool educational organization to the individual, society, and the state. Regulatory and legal support of the educational process in an educational organization. activities of the head of the educational organization and the activities of the teaching staff. Legislation regulating relations in the field of education: The Constitution of the Republic of Kazakhstan as the basis of legal regulation in the field of education. The main legislative acts in the field of education. Educational legal relations in the system of continuing education: the concept, forms of obtaining continuing education.</p>
<p>Examination forms</p>	<p>Project tasks</p> <p>1. Write a project for opening a school in a rural area. When preparing a project, adhere to the following plan: Choosing a school construction site, requirements for a chemistry room, Rights and obligations of a teacher, rights, and obligations of a student. Using the example of a student with disabilities, make a case that defines his legal rights.</p>

	2. Write a project for opening a college in the city. When preparing a project, adhere to the following plan: Choosing a college construction site, requirements for a radiochemical laboratory, based on the Law "On Science", determine the rights and obligations of a college teacher, as well as the rights and obligations of a student. Using the example of a student who wants to transfer to another college, make a case that defines his legal rights.
Reading list	1.Clark, J. D.Masquarrie. Handbook of Green Chemistry/J.Clark, D.Masquarrie–Blackwell. – 2002. – 532 p. 2.Lancaster, M. Green Chemistry: An Introductory Text/ M. Lancaster – New York: Royal Society of Chemistry – 2002. – 300 p. 3. Tundo,P, Green Chemical Reactions/ P.Tundo, V.Esposito – Springer. – 2003. – 213 p.

Module designation	Research practice
Credit points	4
Semester(s) in which the module is taught	3
Relation to curriculum	MD. UNIVERSITY COMPONENT M- 5 Legislation in the system of education and science activity NPBSON RK IP 6305 Research practice
Teaching methods	scientific work, publications, conferences and more
Workload (incl. contact hours, self-study hours)	9 weeks
Person responsible for the module	Satybaldiev Bagdat Senior Lecturer of Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Pedagogy of higher education
Module objectives/intended learning outcomes	- demonstrate practical skills of teaching chemistry in high school;

	<ul style="list-style-type: none"> - possess modern organizational approaches to educational activities on credit technology in higher education institutions; - describe the basic principles of the syllabus, the basic curriculum; - analyze the level of seminars and laboratory classes; - to form psychological and pedagogical skills.
Content	<p>Formation of the abilities of theoretical generalization and practical data research to create an original research portfolio of scientific work based on planning methods, organization of research activities, application of scientific methods for studying objects and an analytical system for their forecasting. Familiarization with modern scientific literature on a specific research topic and methods of its collection, mastering various research methods, acquiring skills in creating research products, acquiring practical skills in broadcasting their own research results to a wide range of specialists in the relevant field, as well as an audience without appropriate professional training. Independent work of a master's student includes processing and analysis of the material collected in online libraries with various information and regulatory bases; preparation of a brief overview of the problems and state of scientific research on the chosen scientific topic; also preparation of a presentation, report and daily practice diary.</p>
Examination forms	Graded
Reading list	Articles of Clarivate Analytics/Scopus Databases

Elective Component (EC)

Modern trends in chemistry

Module Objectives. Students will be able to:

1. formulate the problems and tasks of scientific research in the field of green chemistry, with the choice of methods and means for solving the tasks;
2. explain the principles of using big data in pedagogy;
3. characterize the role of chemistry in the concept of sustainable development;
4. critically evaluate the results of scientific research in the field of chemistry and pedagogy;
5. use computer simulation in pedagogical research, as well as to predict the reactivity of chemicals;
6. analyze structured and unstructured data of large volumes about students and the educational environment;
7. develop methods for describing and modeling the educational process, means for modeling the educational process;

8. introduce innovations in the educational process, using new educational technologies and teaching methods.

Module designation	Computer modeling in education and chemistr
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	CD. Elective component. M-6 Modern trends in chemistry KMOH 6306 Computer modeling in education and chemistry
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 3 hour per week for Lecture, total 45 Contact hours; 6 hour per week for Seminar, total 90 Contact hours.
Person responsible for the module	Nadirov Rashid Kazimovich, Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Organic Chemistry, Mathematics
Module objectives/intended learning outcomes	-explain the principles behind molecular design; -understand the main features and limitations of the practical use of computer modeling; -select the optimal method for the quantum-chemical calculation of a particular system; -identify the assumptions and assumptions underlying specific computer modeling programs; - use the Gaussian program to solve practical problems.
Content	Mathematical methods for modeling and studying the structure and properties of chemical objects on the example of complexes of molecular modeling programs. Visualization of chemical objects, construction of 2D and formation of 3D models. Quantum-chemical methods for calculating the properties of chemical objects. Principles of implementation of

	<p>quantum-chemical calculations. Software packages for quantum chemical research. Energy minimization principle. Semi-empirical methods of quantum chemistry. Ab initio methods of quantum chemistry. Statistical analysis in Excel. Analysis of variance. Hypothesis testing. Data science, its purpose. Machine learning concept. The general scheme for solving real problems using machine learning. Classification of machine learning algorithms. Classification and regression. Linear regression. Logistic regression.</p>
Examination forms	<p>Project examination.</p> <p>Example of exam question:</p> <ol style="list-style-type: none"> 1. Compare two specific methods of quantum chemical modeling of chemical reactions 2. Calculate a specific gas-phase chemical reaction by the quantum-chemical method using the Gaussian program. Two methods should be used (optional); 3. Using the Gaussian program, calculate the structure of the transition state for the formation of the aci-form of nitroethane; 4. Implement hypothesis testing with statistical methods; 5. Using Excel, calculate descriptive statistics for the generated source data, group the data, and build a histogram for the generated dataset.
Reading list	<ol style="list-style-type: none"> 1. Tsyshevsky R.V., Garifzyanova G.G., Khrapkovsky G.M. Quantum-chemical calculations of the mechanisms of chemical reactions: teaching aid. -Kazan, 2012. - 87 p. 2. Bruce P., Bruce A., Gedeck P. Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python. – O'Reilly Media, 2020. 3. Müller, A. C., & Guido, S. Introduction to machine learning with Python: a guide for data scientists. – " O'Reilly Media, Inc.", 2016.

Module designation	Green Chemistry
Credit points	9

Semester(s) in which the module is taught	3
Relation to curriculum	CD. Elective component. M-6 Modern trends in chemistry ZH 6307 Green Chemistry
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 4 hour per week for Seminar, total 60 Contact hours.
Person responsible for the module	Baeshova Azhar Kospanovna Professor of the Department of General and Inorganic Chemistry Nazarkulova Sholpan Nurlanovna, Senior Lecturer of Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Organization and planning of research
Module objectives/intended learning outcomes	- Estimate the concept of sustainable development and the role of chemistry in its implementation. - Demonstrate knowledge and understanding of legislation in environmental protection - Demonstrate knowledge and understanding of green chemistry and nanotoxicology - Use the "green" design of chemical processes - Predict the unconventional methods of activating chemical reactions.
Content	Lecture Trends in the development of the chemical industry in the world and Kazakhstan. Sustainability and green chemistry. 12 principles of "green chemistry". Waste from the chemical industry. Ways to reduce waste. Assessment of the full

	<p>operational cycle. Ecological control systems. Environmental legislation. Catalysis and green chemistry. Heterogeneous, homogeneous and interfacial transfer catalysis. Biocatalysis. photochemical catalysis. Solvents in green chemistry. Organic solvents and volatile organic compounds in industry. Solvent free systems. Supercritical fluids and gases as solvents. Water as a solvent. Ionic liquids as catalysts and solvents. Renewable resources. Biomass as a renewable resource. Fossil fuels and biomass as energy sources. Other alternative energy sources. Green technologies and energy saving. Fuel elements. Chemical products from renewable sources of raw materials. Energy-saving technologies for the production of chemical products.</p> <p>Photochemical reactions. The use of microwave radiation. Ultrasonic chemistry. Electrochemical synthesis. Reactions and processes during microwave irradiation. Mechanochemical activation of substances. Limited hydrocarbon raw materials and their sources. Modern technologies of chemical processing of wood. Synthesis of fuel from biological renewable raw materials (biofuels: biogas, biodiesel and bioethanol). Design principles for green processes. Construction of chemical production schemes and individual reactors based on the principles of green chemistry. Modern green industries: acetic acid, vitamin C, leather, dyes, polyethylene, pesticides. Achievements and prospects of green chemistry. An integrated approach to the complete transition of the chemical industry to green technologies. Problems and solutions.</p>
<p>Examination forms</p>	<p>Project.</p> <p>Tasks:</p> <p>1. Introduction describing the relevance of the project.</p> <p>Trends in the development of the given production (or industry) in the world and Kazakhstan (20%)</p> <p>2. Main part (60%)</p> <p>2.1 Critical assessment of a given production (or industry) in terms of sustainable development (10%)</p>

	<p>2.2 Analyze the given production (or industry) in terms of at least 6 out of 12 principles of ``Green chemistry`` (15%)</p> <p>2.3 Describe the analytical technique and methods for determining the most hazardous component of a given production (10%)</p> <p>2.4. Evaluate the environmental control system and environmental legislation in relation to the given production (or industry). (10%)</p> <p>2.5 Offer energy-saving and eco-friendly production technologies that comply with green chemistry standards. (15%)</p> <p>3. Conclusions and recommendations (20%).</p> <p>4. References</p> <p>Subjects:</p> <p>Pharmaceutical industry</p> <p>Energy production</p> <p>Dyes industry</p> <p>Polypropylene production</p> <p>Household products industry etc.</p>
Reading list	<p>1.Clark, J. D.Masquarrie. Handbook of Green Chemistry/J.Clark, D.Masquarrie–Blackwell. – 2002. – 532 p.</p> <p>2.Lancaster, M. Green Chemistry: An Introductory Text/ M. Lancaster – New York: Royal Society of Chemistry – 2002. – 300 p. 3. Tundo,P, Green Chemical Reactions/ P.Tundo, V.Esposito – Springer. – 2003. – 213 p.</p>

Theoretical and applied Chemistry

Module Objectives. Students will be able to:

1. apply the most important concepts, laws and theories of chemistry to solve problems in chemistry and applied chemistry;

2. describe the main technological processes for the production of the most important chemical products in industrial and laboratory conditions and solve the corresponding problems;
3. characterize the rational use of raw materials and energy in chemical production; mechanisms of chemical reactions and catalytic processes; methods of experiment, analysis and evaluation of laboratory studies;
4. solve typical problems in chemistry and applied chemistry, determining technologically and economically optimal conditions for conducting technological processes;
5. own chemical methods of qualitative and quantitative analysis, methods of mathematical processing of its results;
6. establish cause-and-effect relationships of the facts given in the conditions of the tasks;
7. analyze the conditions of problems and select methods for solving them;
8. formulate the problems and tasks of scientific research in the field of quantum, ecological and applied chemistry, with the choice of methods and means for solving the tasks.

Module designation	Methods of solving tasks at the high school chemistry course
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	Elective component M- 6 Theoretical and applied Chemistry MRZKHVSh 6306 Methods of solving tasks at the high school chemistry course
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks, 2 hour per week for Lecture, total 30 Contact hours; 4 hour per week for Seminar, total 60 Contact hours.
Person responsible for the module	Bekishev Kurman Batyrbekovich, Associate Professor of the Department of General and Inorganic Chemistry Uralbekov Bolat Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Modern general chemistry
Module objectives/intended learning outcomes	- forming professional activities and basis of master chemistry calculation problems in chemistry;

	<ul style="list-style-type: none"> - to develop systems of knowledge, which are necessary for calculation of the quantitative tasks of General and inorganic chemistry; - to form practical skills to solve quantitative problems; - to develop creative activity in chemistry; - to understand the emotional and critical experiences of the environment.
Content	<p>Lecture</p> <p>Methodology for solving problems with the basic stoichiometric laws of chemistry. Content of the concept of equivalent according to the IUPAC to this day. Atomic structure and the periodic table. The law of radioactive decay. Methodology for performing exercises on the topic of valence bonds and the theory of molecular orbitals. Methodology for predicting the spatial shapes of molecules according to the theory of "repulsion of electron pairs in the valence layer" (Gillespie). Fundamentals of chemical Thermodynamics (enthalpy. Hess's law.) Fundamentals of chemical thermodynamics (entropy, Gibbs energy) prediction of the direction of a chemical reaction. Fundamentals of chemical kinetics. The influence of various factors (concentration, temperature, etc.) on the reaction rate. Chemical equilibrium and conditions for its displacement. The principle of Le Chatelier. Fundamentals of the doctrine of solutions. Methods for describing the composition of solutions. Colligative properties of liquefied solutions. Solutions of electrolytes. Theory of electrolyte dissociation. Ionic balances in solutions (pH, EC, hydrolysis). Redox reactions (TTR). Electrolysis. Faraday's laws. Prediction of the direction of a chemical reaction by electrochemical data. (Separation and practical conclusions from it.) Crystal field theory. Ionic balances in solutions of complex compounds.</p>
Examination forms	<p>Written exam</p> <p>Example of exam question:</p> <p>1. Issue a report:</p> <p>a) a metal with a mass of 1.28 g when interacting with water at a temperature of 210°C and 104.5 kPa (784 mm. Hg.) hydrogen is released so that the volume under pressure is 380 mL. Determine the molar mass of the metal equivalent.</p>

	<p>b) construct energy diagrams of molecules CO, O₂, N₂ and CN by the MO method and predict bond multiples and magnetic properties.</p> <p>2. Issue a report:</p> <p>A) when a mixture consisting of equal volumes of SO₂ and O₂ gases passes through the contact apparatus, 90% of the SO₂ molecules are converted into SO₃ molecules. Determine the composition (in volume fraction) of the gas mixture coming out of the contact apparatus,</p> <p>B) when the temperature was raised from 280K to 300K, the reaction rate increased 10 times. Calculate the activation energy of the reaction.</p> <p>3 Equation Electronic Balance and partial reactions (Ionic-Electronic Balance) equate with the methods of:</p> $\text{C}_2\text{H}_5\text{ON} + \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 = \text{CH}_3\text{COH} + \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{H}_2\text{O}.$
Reading list	<p>1. Bekishev K. chemistry problems. - Almaty: Kazakh university, 2017. - 223 P.</p> <p>2. Bekishev K., Ryskaliyeva R. problems and exercises of general chemistry. - Kazakh university, 2015.- 176 p.</p> <p>3. Glinka N. L. problems and exercises in general chemistry. - Almaty: Kazakh university, 2017. – 303p.</p>

Module designation	Modern aspects of applied chemistry
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	MD. Elective component. M-6 Theoretical and applied Chemistry SAPH 6307 Modern aspects of applied chemistry
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	15 weeks,

	<p>2 hour per week for Lecture, total 30 Contact hours;</p> <p>4 hour per week for Seminar, total 60 Contact hours;</p>
Person responsible for the module	<p>Yarovaya Yelena Yuriyevna,</p> <p>Senior Lecturer of Department of General and Inorganic Chemistry</p> <p>Dalabaeva Nazgul Sanakovna</p> <p>Senior Lecturer of Department of General and Inorganic Chemistry</p>
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Modern general chemistry,
Module objectives/intended learning outcomes	<ul style="list-style-type: none"> - description of the main technological processes of production of the most important chemical products in industrial and laboratory conditions; - description of the rational use of raw materials and energy in chemical production; mechanisms of chemical reactions and catalytic processes; methods of experiment, analysis and evaluation of laboratory studies; - ability to solve typical problems in applied chemistry, to determine technologically and economically optimal conditions for technological processes; - ability to possess chemical methods of qualitative and quantitative analysis, methods of mathematical processing of its results; - evaluation of the main areas of practical application of chemistry in the national economy, for the production and use of products of specific chemical industries, taking into account the main directions of the chemization of the economy and the social sphere.
Content	<p>Lectures:</p> <p>Applied chemistry subject. Chemicalization is one of the aspects applied chemistry. Essence chemicalization of the</p>

	<p>economy and social sphere. Terms implementation of chemization. Classification of energy resources.</p> <p>Modern production structure energy. Trends in the development of energy. Traditional (fuel) energy.</p> <p>Composition of various types of fuel; fuel properties, quality indicators; methods of extraction and enrichment. Peat is a renewable fuel. Features of peat as a fuel.</p> <p>Chemical composition. Oil. Chemical aspects of mining</p> <p>oil - drilling, use chemical methods to increase "recovery" of oil from the reservoir. Problems petrochemical safety</p> <p>production, transport and storage oil and oil products. Fertilizers, their types, obtaining. Complex fertilizers. Principles use, modern trends in fertilizer use. Environmental problems. Problem nitrates. The problem of chemical control of raw materials, assessment of food quality. Artificial and synthetic food.</p>
<p>Examination forms</p>	<p>Written examination.</p> <p>Example of exam question:</p> <ol style="list-style-type: none"> 1. List alternative traditional energy sources, in the use of which chemical processes predominate. 2. When burning what type of fuel (solid, liquid or gaseous) will release more amount of energy. Support your answer with calculations. (OK-5,OPK-5, PK-9). 3. Describe the energy problems and ways to solve them. Give examples of the main sources of energy. 4. Describe new materials as promising chemical products and the technology for their production. 5. Analyze hydrogen energy: problems and development prospects.
<p>Reading list</p>	<p>1. Marquita K. Hill. Understanding Environmental Pollution. Cambridge University Press, 2010, 585 p., ISBN-13 978-0-511-90782-1</p>

	<p>2.Sharafi, K; Nodehi, RN; Yunesian, M; Mahvi, AH; Pirsahab, M; Nazmara, S (2019) Human health risk assessment for some toxic metals in widely consumed rice brands (domestic and imported) in Tehran, Iran: Uncertainty and sensitivity analysis. FOOD CHEMISTRY, 277: 145-155</p> <p>3.Lee, YN; Lee, S; Kim, JS; Patra, JK; Shin, HS (2019) Chemical analysis techniques and investigation of polycyclic aromatic hydrocarbons in fruit, vegetables and meats and their products, FOOD CHEMISTRY, 277: 156-161 DOI: 10.1016/j.foodchem.2018.10.114</p> <p>4.Whyand, T; Hurst, JR; Beckles, M; Caplin, ME Pollution and respiratory disease: can diet or supplements help? A review // RESPIRATORY RESEARCH, 19: 79 DOI: 10.1186/s12931-018-0785-0</p>
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REASEARCH

Module designation	REASEARCH WORK
Credit points	24
Semester(s) in which the module is taught	1-4
Relation to curriculum	UNIVERSITY COMPONENT
Teaching methods	scientific work, publications, conferences and more
Workload (incl. contact hours, self-study hours)	60 weeks, scientific work, publications, conferences and more NIRD 1-3 NIRD 2-14 NIRD 3-3 NIRD 4 -4
Person responsible for the module	Uralbekov Bolat Professor of the Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Modern general chemistry, Organization and planning of research, Didactic chemistry, The methodology of chemical-pedagogical investigations, Computer modeling in education and chemistry.
Module objectives/intended learning outcomes	Publications, conferences and more

Content	To form the ability to apply modern methods and methodologies of scientific research when performing a master's thesis. Within the framework of the study, methods and techniques of pedagogical research are studied and mastered; modern experimental approaches to describing the results obtained; stages and principles of planning a pedagogical experiment; features of using pedagogical research methods during an experiment that can solve the purpose of experimental work.
Examination forms	Oral examination and publications Practical/laboratory exercises, SIW should be independent, creative. Plagiarism, forgery, the use of cheat sheets, cheating at all stages of control are unacceptable.
Reading list	Articles of Clarivate Analytics/Scopus Databases

Module designation	MASTER THESIS WRITING AND DEFENCE
Credit points	12
Semester(s) in which the module is taught	4
Relation to curriculum	
Teaching methods	scientific work, publications, writing a dissertation
Workload (incl. contact hours, self-study hours)	6 weeks
Person responsible for the module	Satybaldiev Bagdat Senior Lecturer of Department of General and Inorganic Chemistry
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	Modern general chemistry, Organization and planning of research, Didactic chemistry, The methodology of chemical-pedagogical investigations, Computer modeling in education and chemistry.
Content	The final certification of undergraduates is carried out in the form of writing and defending a master's thesis. The State Attestation Commission (SAC) is created to conduct the final attestation of students. Undergraduates who have fully completed the educational process in accordance with the requirements of the working and individual curriculum and working curricula, and who have received admission to the defense from the supervisor, are allowed to the final certification. The master's thesis is defended at an open meeting of the attestation commission. Students should publish at least one scientific publication on the topic of their master's thesis. Before defending master's theses, they undergo a mandatory plagiarism check in the UNIVER system.

	<p>The results of the defense of the final work are announced on the day of their holding. Decisions on defense assessments, as well as on awarding qualifications, awarding an academic degree and issuing a state diploma (without distinction, with distinction) are made by the attestation commission at a closed meeting by open voting by a simple majority of the votes of the commission members participating in the meeting.</p> <p>A master's student who has passed the final certification and has confirmed the development of educational programs is awarded a master's degree by the decision of the attestation commission, a qualification is awarded according to the relevant educational programs and a diploma with an appendix is issued free of charge. In the appendix to the diploma, the latest grades are indicated in accordance with the point-rating letter system of grades for all academic disciplines, completed coursework (projects), research work, types of professional practice, final certification, indicating their volume in academic credits and hours. Graduates of Master's degree programs receive a European diploma supplement for free in addition to their diploma.</p>
Examination forms	Public defence

