



ASIIN Seal

Accreditation Report

Bachelor's Degree Programmes

Chemistry

Pharmaceutical Manufacturing Technology

Master's Degree Programmes

Chemistry

Chemistry (ped.)

PhD Programme

Chemical Engineering

Provided by

Al-Farabi Kazakh National University

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A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for ¹	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) ²
6B05301 Химия	6B05301 Chemistry	ASIIN	ASIIN, 31.03.2017 – 30.09.2022	09
7M05301 Химия	7M05301 Chemistry	ASIIN	ASIIN, 31.03.2017 – 30.09.2022	09
7M01503 Химия	7M01503 Chemistry	ASIIN	ASIIN, 31.03.2017 – 30.09.2022	09
6B07201 Технология фармацевтического производства	6B07201 Pharmaceutical Manufacturing Technology	ASIIN		09
8D07102 Химическая инженерия	8D07102 Chemical Engineering	ASIIN		09, 01
Date of the contract: 26.09.2022				
Submission of the final version of the self-assessment report: 10.02.2023				
Date of the onsite visit: 02.-04.05.2023				
at: Al-Farabi Kazakh National University, Faculty of Chemistry and Chemical Technology				
Peer panel:				

¹ ASIIN Seal for degree programmes.

² TC: Technical Committee for the following subject areas: TC 01 - Mechanical Engineering/Process Engineering; TC 02 - Electrical Engineering/Information Technology; TC 03 - Civil Engineering, Geodesy and Architecture; TC 04 - Informatics/Computer Science; TC 05 - Materials Science, Physical Technologies; TC 06 - Engineering and Management, Economics; TC 07 - Business Informatics/Information Systems; TC 08 - Agriculture, Forestry, Food Sciences, and Landscape Architecture; TC 09 - Chemistry; TC 10 - Life Sciences; TC 11 - Geosciences; TC 12 - Mathematics; TC 13 - Physics.

A About the Accreditation Process

Prof. Dr. Hans-Jürgen Duchstein, University Hamburg Prof. Dr. Klaus-Uwe Koch, Westphalian University of Applied Sciences Prof. Dr. Alibek Khabiyev, Satbayev University Dr. Dietrich Scherzer, Neustadt Aigerim Ayazbayeva, Satbayev University, PhD student	
Representatives of the ASIIN headquarter: Dr. Natalia Vega	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 09 – Chemistry, Pharmacy as of March 29, 2019 ASIIN Additional Criteria for Structured Doctoral Programmes as of March 15, 2021	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
6B05301 Chemistry	6B05301 Химия / Bachelor of Natural Sciences on the educational program "6B05301 – Chemistry"	Field of education: Natural Sciences, Mathematics and Statistics Field of study: Physical and Chemical Sciences Available specializations: chemical expertise, nanochemistry, green chemistry	Level 6	Full time	-	8 Semester	240 ECTS	Yearly, since 2010
6B07201 – Pharmaceutical Manufacturing Technology	6B07201 Технология фармацевтического производства / Bachelor of technics and technologies on the educational program "6B07201 – Pharmaceutical Manufacturing Technology"	Field of education: engineering, manufacturing and construction industries Direction of training: Manufacturing and processing Available specializations: technologies for production of medicinal substances, excipients, drugs and medical devices; their analysis and standardization	Level 6	Full time	-	8 Semester	240 ECTS	Yearly, since, 2019

³ EQF = The European Qualifications Framework for lifelong learning

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
7M05301 Chemistry	7M05301 Химия / Master of Natural Sciences on the educational program "7M05301 – Chemistry"	Field of education: Natural Sciences, Mathematics and Statistics Field of study: Physical and Chemical Sciences Available specializations: inorganic, analytical, colloidal, organic and polymer chemistry, electrochemistry, chemical enzymology	Level 7	Full time	7M05302 - Chemistry (BeISU) 7M05319 - Chemical Materials Science (MSU) 7M05318 - Chemical Physics (NRNU "MEPhI")	4 Semester	120 ECTS	Twice a year (summer-winter set), since 2010
7M01503 Chemistry	7M01503 Химия / Master of Pedagogical Sciences on the educational program "7M01503 – Chemistry"	Field of education: Pedagogical Sciences Direction of training: Training of teachers in natural science subjects	Level 7	Full time	-	4 Semester	120 ECTS	Twice a year (summer-winter set), since 2012
8D07102 Chemical Engineering	Химическая инженерия / Doctor of Philosophy (PhD) on the educational program "8D07102 – Chemical Engineering"	Field of education: Engineering, manufacturing and construction industries Direction of training: Engineering and Engineering Available specializations: Petrochemical, biochemical, electrochemical, environmental engineering, technologies for processing natural and man-made raw materials	Level 8	Full time	-	6 Semester	180 ECTS	Twice a year (summer-winter set), since 2019

B Characteristics of the Degree Programmes

Name	Intake rhythm	Intake Capacity per cohort	Average starting cohort size	Average number of graduates per cohort	Average time required to complete studies
6B05301 Chemistry	yearly	Max. 250 students	180 students	170 students	8 semesters / 4 years
6B07201 Pharmaceutical Manufacturing Technology	yearly	Max. 100 students	120 students	115 students	8 semesters / 4 years
7M05301 Chemistry	Twice a year (summer- winter set)	Max. 50 students	20 students	25 students	4 semesters / 2 years
7M01503 Chemistry (ped)	Twice a year (summer- winter set)	Max. 80 students	35 students	25 students	4 semesters / 2 years
8D07102 Chemical Engi- neering	Twice a year (summer- winter set)	Max. 15 students	5 students	5 students	6 semesters / 3 years

Al-Farabi Kazakh National University (KazNU) is a state university located in the cosmopolitan city Almaty, which has a population of around 2,161,695 inhabitants. It was founded on January 15th, 1934 as one of the first universities in Central Asia and Kazakhstan. Al-Farabi KazNU was ranked 150 in the QS World University Rankings 2023 and 44th in the QS Asia University Rankings 2023. Currently, the university has 16 faculties (Faculty of Mechanics and Mathematics, Faculty of Chemistry and Chemical Technology, Faculty of Physics and Technologies, Faculty of Informational Technology, Faculty of Biology and Biotechnology, Faculty of Geography and Environmental Sciences, Faculty of History, Archeology and Ethnology, Faculty of Philology and World Languages, Faculty of Journalism, Faculty of International Relations, Oriental Studies Faculty, Faculty of Philosophy and Political Science, High School of Economics and Business, Law Faculty, Preparatory Faculty for Foreign Students and Higher School of Medicine) and 68 departments. About 25.000 students are enrolled from which 2973 are international students.

The Faculty of Chemistry and Chemical Technology of Al-Farabi KazNU is one of the first departments of the university, opened in 1934, and one of the leading scientific and edu-

cational centers in Kazakhstan, occupying a leading position in the national rating of educational programs in the chemical profile. It is divided in the following six departments: i) General and Inorganic Chemistry; ii) Chemistry and Chemical Technology of organic substances, natural compounds and polymers; iii) Analytical Colloidal Chemistry and Technology of rare Elements; iv) Chemical Physics and Material Science; v) Physical Chemistry, Catalysis and Petrochemistry; and vi) Technology of Metals and minerals. Currently, the faculty has more than 1,500 students in 21 specialties and three levels of training.

For the Bachelor's degree programme **Chemistry** the institution has presented the following profile in the module handbook: the purpose of the programme is "training of personnel capable of professionally performing activities in the areas of: scientific research; creation of new types of chemical products; innovative technologies; product quality control, standardization and certification of raw materials and products; secondary and vocational education. The bachelor will be able to solve problems in the following areas: modern theoretical and applied chemistry; chemical expertise; green chemistry; nanochemistry and nanomaterials; development and design of composite materials".

According to the module handbook, the Master's degree programme **Chemistry** aims to train "highly qualified personnel with professional competencies sufficient for the development of new knowledge and effective solutions of research and applied problems in the field of modern theoretical chemistry and chemical industry. Master could carry out professional activities in the following areas:

- Research in various fields of modern chemistry;
- creation of new types of chemical products and materials, improvement of existing and development of new chemical processes based on the latest achievements in the field of chemistry and related disciplines in accordance with the needs of the market, industry and agriculture;
- improvement and development of methods of quality control, standardization and certification of raw materials and chemical products;
- secondary, professional and higher education."

Furthermore, the **Master programme Chemistry (ped.)** ("Master of Pedagogical Sciences on the educational program Chemistry") focus on pedagogical sciences and training of teachers in natural science subjects. The programme general objective is to prepare "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".

Regarding the **Bachelor's degree programme Pharmaceutical Manufacturing Technology**, the purpose of the programme according to the module handbook is “qualitative and multilateral training of competitive specialists in the field of pharmaceutical production technology demanded on the labour market of the Republic of Kazakhstan. The educational program is aimed at shaping the personality of a specialist with critical thinking, able to improve professional competences for the development, design and implementation of new and existing drug manufacturing technologies into the pharmaceutical production”.

According to the Self-Assessment-Report provided by the university, the **PhD Chemical Engineering** aim to “train research and scientific-pedagogical personnel (PhDs) in the field of chemical engineering for universities, research organizations and related fields, who are capable to:

- systematize the scientific theories and concepts of the latest directions of chemical engineering with the aim of further applying this knowledge in the implementation of the dissertation research;
- perform independent planning and conducting scientific research based on the choice of an actual scientific task, as well as the analysis and interpretation of the obtained data;
- present the results of their research in scientific discussions and publications;
- organize and manage research work to solve actual problems of chemical engineering;
- develop new cost-effective technologies and schemes for the production and processing of substances and materials with desired properties;
- develop and implement educational training courses in chemical technology in higher education organizations;
- manage production services and enterprises in the field of production and processing of materials of the chemical industry.”

C Peer Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)

Evidence:

- Module Handbooks
- Learning Objectives-Module Matrices
- Self-Assessment-Report (SAR)
- University Website: <https://www.kaznu.kz/en>
- Ministry of Education and Science of the Republic of Kazakhstan, Unified system of management of higher education (<http://esuvo.platonus.kz/#/>)
- Information on the employment of graduates
- Information on the areas of employment and employers:
 - <https://www.kaznu.kz/en/25055/page/> for Bachelor in PMT;
 - <https://www.kaznu.kz/en/25049/page/> for Bachelor in Chemistry;
 - <https://www.kaznu.kz/en/26259/page/> for MA Chemistry (ped.);
 - <https://www.kaznu.kz/en/26172/page/> for MA Chemistry;
 - <https://www.kaznu.kz/en/25163/page/> for PhD Chemical engineering.
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The experts refer to the respective ASIIN Subject-Specific Criteria (SSC) of the Technical Committee 9 (Chemistry) and, in case of the PhD programme Chemical Engineering the Technical Committee 1 (Mechanical Engineering/Process Engineering), the learning-module-matrices for each degree programme, and the modules as a basis for judging whether

the intended learning outcomes of the degree programmes under review correspond with the competences as outlined by the SSC.

The Learning Outcomes for each programme are described in the SAR and module handbooks as well as in the Diploma Supplement and University Website.

According to the university website, graduates of the **Chemistry bachelor's degree programme** are capable to work in several professions, for example, as researchers at manufacturing companies, research institutes or scientific organizations; as teacher in higher educational institutions or colleges or in schools; as senior position in the field of education. With regard to the job market perspectives, KazNU presents an overview about the employment of graduates. During the last five years (2018-2022), for the **Bachelor in Chemistry** a total of 91 % of the graduates are employed, for **MA Chemistry** and **MA Chemistry (ed.)** 100 %, and for the **Bachelor in Pharmaceutical Manufacturing Technology** in the last year (2021-2022) 83 %.

During the audit, the experts learn from the programme coordinators that most graduates from chemistry programmes are employed in the education sector (schools, colleges and higher education institutions) or in chemical research institutes or laboratories. Regarding the Bachelor's degree in Pharmaceutical Manufacturing Technology, they explain that the pharmaceutical industry in Kazakhstan is now in the development stage and needs more specialists, especially in the field of pharmaceutical production. Industry representatives confirm this situation. They explain that the chemical industry in Kazakhstan is still developing and salaries are not so high, especially at the beginning of a career, and sometimes jobs in the education sector can offer good income and security. In the future, as the industry develops in the country, they are sure that the demand for graduates will increase and the industry will need more PhD graduates.

After reviewing the learning outcomes and discussing them with the various stakeholders, the experts conclude that the descriptions of the qualification objectives are comprehensive and include the competences achieved and the possible career opportunities for graduates. The objectives and learning outcomes are made available to all stakeholders as they can be found on the KazNU website. In addition, they are anchored and published in a transparent manner, making them available to students, lecturers and interested third parties. On the basis of a Learning Objectives-Module Matrix presented at the beginning of each module handbook, which describes the modules in which students learn the skills envisaged in the PLOs, the expert group considers that the intended learning outcomes of the programmes are suitable for producing qualified graduates. However, they are of the opin-

ion that learning outcomes could be more specific and clear described in the module descriptions. The auditors recommend to provide the module descriptions by better learning outcomes for the future.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment-Report (SAR)
- Discussion during the audit
- University Website: <https://www.kaznu.kz/en>

Preliminary assessment and analysis of the peers:

According to the SAR, the names of the programmes under review are consistent with the National Qualifications Framework of the Republic of Kazakhstan, which was developed in accordance with the European Qualifications System and its descriptors, as well as with the principles of the Bologna agreements and the Dublin descriptors.

The experts consider that the names of the programmes correspond to the intended programme and learning outcomes, as well as to the main language of the course. The experts agree that the teaching and learning content and the competence profile are consistent with the proposed title of the programme.

Criterion 1.3 Curriculum

Evidence:

- Module Handbooks
- Self-Assessment-Report (SAR)
- Annex: List of International Students
- Annex: Academic Mobility
- Annex: Courses of invited foreign professors
- Annex: Information about practice internship
- University website: <https://www.kaznu.kz/>
- Annex- Short-term internships for bachelor master doctor students
- Annex - Information about practice internship

Preliminary assessment and analysis of the peers:

The **Bachelor's degree in Chemistry (6B05301)** is a four-year programme, upon completion of which graduates are awarded a Bachelor of Natural Sciences on the educational programme degree. In order to obtain this degree in Chemistry, students have to fulfil university, faculty and departmental requirements and complete 240 ECTS credit hours.

As part of its Self-Assessment Report, KazNU presents the structure of its Chemistry Bachelor program. It features three cycles - general education disciplines (GED), basic disciplines (BD) and major disciplines (MD), as well as professional practices and graduation thesis. The cycle of general education disciplines consists of a compulsory component and an optional component. The cycles of basic and major disciplines also include two components: the disciplines of the university component and the elective component.

The cycle of basic disciplines, including the university component, consists of six modules:

1. The **General Chemistry and Mathematics module** includes mathematics, general chemistry and professional (teaching) practice.
2. The **Physics and Physical Chemistry module** makes it possible to effectively use the knowledge and skills acquired during the study of physics, to apply it to the development of physical chemistry.
3. The **Inorganic and Organic chemistry module** focuses on the theoretical foundations of fundamental chemical sciences.
4. The **Analytical Chemistry module** includes the basic concepts of analytical chemistry and a professional (industrial) internship.
5. The **Structure of matter and physical methods of research module** provides professional training in the field of modern analysis.
6. The **Metrology and Standardization in Chemistry module** includes Metrology as well as Standardization and a professional (industrial) internship.

As the University states in its SAR, the duration of the internship is determined in weeks, based on the standard time of the student's work in practice during the week, equal to 30 hours (6 hours per day in a 5-day working week). The teaching internship, carried out during the first year, introduces the students to real working conditions in the University's research centres using the theoretical knowledge acquired. The industrial internship during the second year is aimed at familiarising students with the main tasks and functions of chemical research and at consolidating the theoretical knowledge already acquired. The practical training of students after the end of the 3rd and 4th courses, respectively, develops the student's practical skills in the field of design and execution and processing of the

obtained experimental data. Students get acquainted with the procedures of statistical processing of the received data, analytical techniques and preparation of research reports. Finally, “pre-graduate practice” aims to deepen the acquired professional experience, to consolidate general and professional skills, to check the readiness for independent work and to prepare for the completion of the thesis.

According to the SAR, the design of the curriculum and selection of disciplines is based on a comparative analysis of the curriculum and on the experience of the world's TOP 300 leading universities. Furthermore, the development of scientific areas of chemical sciences, the requirements of the labour market, the requests and proposals of employers, the directions of scientific schools and the interests of students were considered in this process. The university emphasize that through the choice of modules, the structure ensures the achievement of learning outcomes and allows students to determine their individual focus and course of study (student mobility, work experience, etc.). The curriculum is designed to allow students to complete their degree without exceeding the usual course duration. Moreover, all internship or work experience internships are well integrated into the curriculum.

The **Master’s Degree Programmes Chemistry (7M05301)** and the **Ma Chemistry (ped.) (7M01503)** have both a duration of four semesters and 120 credits (Chemistry Core – 27,5%; Electives – 36,7%; State Compulsory - 10%, Research Seminars /Thesis -23,3%, Internship – 2,5%). The degrees awarded by graduates of these programmes are “Master of Natural Sciences on the educational program– Chemistry” and “Master of Pedagogical Sciences on the educational program” respectively. Both programmes consist of three components: Core Disciplines (CD), Major Disciplines (MD) and Research. Each one is divided in University Component and Elective Component. In the two programmes under review, the university component of CD contains mainly fundamental disciplines that ensure the development of the personality of a graduate student as a future scientist such as: History and Philosophy of Science, Foreign language, Pedagogy of higher education, Psychology, Teaching Internship. The teaching internship of this module takes place in the Faculty of Chemistry and Chemical Technology. During the first seven weeks, the master's students get acquainted with the details of the educational process and, after that, they can give three lectures and conduct one laboratory work and one educational event. At the final stage, each master student has to present a report about the internship.

The **Master’s Degree Programme Chemistry (7M05301)** is offered as double-degree by the Department of Chemistry and Chemical Technology in collaboration with following Master programmes and institutions: Master’s degree in Chemistry (Belgorod State University), Chemical Materials Science of the Michigan State University (MSU), and Chemical Physics (National Research Nuclear University, Moscow Engineering Physics Institute). The first

year includes three in-depth courses that cover tools and theories in modern chemistry. The courses focus primarily on advanced instrumental methodologies for chemical analysis, and modelling and interpretation of physico-chemical and biochemical phenomena. These courses also offer intense laboratory training for advanced courses and the Master's thesis in the second year. The curriculum also focusses on research methods and organization as well as on the application of analysis methods and in scientific writing. The University and Elective Component of MD is, for example, "Organization of research in the field of modern chemistry" which includes "Theory and problems of Physical Chemistry", "Organization and Planning of Scientific Research" and "Research practice" during the first three semesters. Furthermore, the Elective Component of CD is a module about "Selected Chapter of the main directions of chemistry". This module contains such disciplines as: "Advanced chapters of organic chemistry"; "Advanced chapters of analytical chemistry"; "Contemporary problems of organic chemistry"; "Modern problems of inorganic chemistry"; "Advanced analytical chemistry"; "Selected chapters of organic chemistry". In the master's degree, these subjects are aimed at developing the student's abilities to discuss and solve scientific problems and at familiarizing with scientific trends in the development of chemical science. Each undergraduate student can choose one of following modules for the elective component of MD: Organic Chemistry, Analytical chemistry, Physical Chemistry, High Molecular Compounds Chemistry, Colloid Chemistry and Chemical enzymology. The fourth semester consists of the module Master's Student Research which includes scientific internship and dissertation writing as well as Master's Thesis.

The **Ma Chemistry (ped.) (7M01503)** contains more credits in the field of pedagogy. For instance, the University Component of MD includes the "Module of organization of Scientific and Pedagogical activity" in the first two semesters and during the third semester the module "Legislation in the system of education and science" including the discipline "Regulatory framework of education and science system of the Republic of Kazakhstan". Regarding CD, the elective Component consists, in the first and second semester, of two alternative modules: the module "Current trends in educational and chemistry" and "Module of methods of teaching chemistry and modern chemistry." A pedagogical internship is included in this programme too. Each semester contains a research component that includes a scientific internship, publications in a scientific journal / materials of a scientific and practical conference and the completion of a master's thesis. The expert group discuss the methods to develop the teaching abilities of students of the Master's programme Chemistry (ped.). The programme coordinators explain that they have a teaching internship in the second semester. Thereby, they should acquire and consolidate their teaching skills, methods for the preparation of a subject and the organization of the course activities.

The programme **Ba Pharmaceutical Manufacturing Technology** is offered as a 4-year program with 240 ECTS credit hours, upon completion of which graduates are awarded a “Bachelor of technics and technologies”. The programme consists of three cycles of disciplines – general education disciplines (GED), core disciplines (CD) and major disciplines (MD). GED cycle includes obligatory component (OC), university component (UC) and/or elective component (EC). CD cycles and MD cycles include UC and EC disciplines. Required components of the fundamental core educational program have general cultural, national importance, and educational program in general provides a single educational space in the country. Based on successful theoretical and practical results on creation and implementation of original domestic drugs by the teaching staff of Al-Farabi KazNU, the educational program includes theoretical subjects, practical and laboratory studies in the cycle of core and major disciplines. All disciplines are divided into modules, some of which include professional internships.

The university component of the cycle of core disciplines consists of six modules:

1. **Physics and mathematics module:** includes physics and, for two semesters, mathematics, in order to master methods and tools for solving theoretical and applied chemical problems, technological calculations in planning and developing production cycles and operations, validation of technological processes and analytical techniques.
2. **Module of General Engineering:** contains disciplines that form the basis for engineering education, methods and means of computer graphics, automated design of processes and apparatus for chemical and pharmaceutical production, computer modelling of biologically active substances etc.
3. **Module of Inorganic Substances and their Identification:** includes theoretical foundations of chemical science and basic skills for conducting laboratory experiments, solving practical problems, and getting acquainted with real scientific problems and methods.
4. **Module of Organic Substances and Biomolecules:** imparts knowledge in the general laws relating structure and properties of organic compounds of synthetic and natural origin, their synthesis and biochemical transformations, which is a prerequisite for understanding the structure of medicinal substances and methods for their synthetic creation.
5. **Module of Pharmaceutical Manufacturing:** consists of disciplines that provide engineering training in the area of calculation, modelling and design of processes and devices for pharmaceutical production, as well as optimization and implementation of these processes and production equipment. In addition, this module includes an internship at pharmaceutical enterprises.

6. Module of Production Technology of Pharmaceutical Preparations: deals with the basic concepts and theoretical foundations of pharmaceutical technology, industrial production issues, state regulation for production of medicines and their quality control, modern requirements for production of drugs, which culminates in special practice at pharmaceutical enterprises.

Moreover, the elective component of CD includes four modules in following areas: physico-chemistry for dispersed and polymer systems; mechanisms of pharmaceutical; medicinal plant substances; and plant polyphenols and their effects on the body. The cycle of MD (university component) consists of the module for production of synthetic substances and their bioavailability, the module of dosage forms and medical products and the module of state control of pharmaceutical products. The elective component in the cycle of major disciplines includes of four modules, each of which consists of four disciplines: technology for production of substances and drugs, pharmaceuticals analysis, technology for finished drugs and safety and efficiency of drugs.

Several professional practices are integrated in this programme. A first training is carried out at the first year in order to introduce students to the actual work conditions in the University research centres. Furthermore, the professional practice of second year, which is carried out in enterprises, institutions and organizations, focus on the industrial production of drug substances and preparations in accordance with the international standards. During the end of the third and fourth year, professional internship of students, respectively, consolidate the theoretical knowledge of students and develop their practical skills in designing and equipping of pharmaceutical production and development of technology of production of medicinal preparations. Moreover, students get acquainted with validation procedures for processes and analytical methods and preparation of their reports. The “Pre-diploma practice” aims to deepen the accumulated professional experience, consolidate general and professional competencies as well as to prepare for the implementation of the final thesis. Training and professional practice is conducted in accordance with the approved academic calendar and the individual work plan established in the curriculum. The duration of the internships is defined in weeks, based on the standard time of the learner to practice during the week (30 hours, composed of 6 hours per day at a 5-day week).

During the audit, the experts learn from the teacher’s explanations how the procedure to choose elective courses is. Students choose a track and then choose electives in this field from a catalogue. They have the option to ask their advisors for support about the selection of the electives. In addition, the students are asked by the experts about their opinion about the curriculum. They express their satisfaction with the content and the structure and sequence of the modules, the broad offer of electives and internships and support of

the university. Furthermore, they emphasize that the university offers many opportunities for research and scientific activities. Students of the programme Pharmaceutical Manufacturing Technologies find very interesting the special courses in the area of pharmaceutical and manufacturing production and the focus on the development of practical skills. However, they believe that some manufacturing courses have the same or similar contents. According to them, they already suggested a change to avoid repetition of the information and contents. Furthermore, the experts learn about a Master' programme in the field of Pharmacology which was not mentioned before.

Moreover, the participant industry partners stress that students are very motivated and interested in future technologies. Students have good fundamentals and theoretical knowledge. Nevertheless, the experts learn from the industry partners that practical skills like laboratory work should be improved. In the area of pharmaceutical manufacturing, they noted that students are not familiar with registration of drugs and GMP. They recommend the university to introduce more content in this area in the curriculum. Regarding soft-skills, they believe that this aspect was already improved and they are making progress.

In addition, regarding laboratory work, the auditors learn from the teaching staff that bachelor students have approx. four hours per week in each discipline. The teachers emphasize that students have during the bachelor's study enough laboratory practice. In the Master's degree, it depends on the specialty students choose. For example, in chemical engineering, there is more laboratory hours.

Periodic Review of the Curriculum

According to the SAR provided by KazNU, the curriculum of all programmes under review is periodically reviewed in accordance with the requirement of all the stakeholders. The management of the faculty and departments monitors periodically the relevance of goals, expected learning outcomes, the expediency of the teaching methods used, the content of modules and disciplines and the topics of seminars and laboratory classes. This is carried out based on the analysis twice a year of the results of a questionnaire for all stakeholders: students, employers, teachers, graduates. This process of design and developing the curriculum is based on following regulations: "The procedure for the development and approval of educational programs of higher and postgraduate education of Al-Farabi Kazakh National University", "Guidelines for describing the results of training at Al-Farabi Kazakh National University", "Rules for attracting employers to the development, implementation and evaluation of the quality of educational programs at Al-Farabi Kazakh National University", "Regulations on the coordinator of educational programs".

Based on the work carried out to improve and update the content of the educational program **6B05301 – “Chemistry”** and **“7M01503-Chemistry”**, some changes were made. For instance, the curriculum and learning outcomes were updated; several disciplines are now combined, which makes it possible to fully focus on the theoretical basis and on the study of the practical significance of the methods and approaches of this discipline (e.g. "Physical Chemistry 1" and "Physical Chemistry 2" were combined into one "Physical Chemistry or "Molecular Design" and "Big Data in Education" are combined into the discipline "Computer Modelling in Education and Chemistry" etc.); the number of credits of some disciplines due to their relevance and practical significance has been increased to 9 credits disciplines include (cf. "Fundamentals of Chemical Technology", "Chemistry of high-molecular compounds" and "Colloidal Chemistry"). The discipline "Regulatory framework of the education and science system of the Republic of Kazakhstan" was transferred to the major disciplines university component and its credits is increased to 9.

Regarding the **Ba Pharmaceutical Manufacturing Technology**, the curriculum was designed and developed in accordance with the relevant and innovative changes in the global pharmaceutical industry and medical practice. For instance, since 2015, in the Republic of Kazakhstan, local producers of medicinal preparations are moving their production in accordance with the requirements of the following four good practices harmonized with the World Health Organization's standards.

Furthermore, the KazNU TOEFL Center was established at the Department of Foreign Languages of Natural Faculties, in order to improve the level of English proficiency. This center prepares students also for this language tests.

Student mobility

In its self-report, KazNU emphasizes that the University encourage teaching or research activities abroad with obligatory ECTS. Students of the programmes under review can study or carry out research stays in any university of the Republic of Kazakhstan, in scientific institutes as well as in universities abroad in accordance with a bilateral agreement on academic mobility. The Academic Advisor and Programme Coordinator also provide assistance to students wishing to study abroad.

Registration, training and transfer of credits is based on the rules of the Al Farabi Kazakh National University. The academic mobility of students of Al-Farabi KazNU is carried out in accordance with inter-institutional agreements or joint projects. State budget for scholarships for academic stays abroad is available for each student. The credit transfer is determined by agreement based on the curriculum of KazNU programmes and is entered in the transcript of the student in the "Univer" system. The issuing department is responsible for the objective establishment of credits and courses equivalences. The maximum number of

credits allowed to recount from other national universities of the Republic of Kazakhstan should not exceed 20% of the curriculum in one school year and, in foreign educational organizations, depends on the foreign university rankings and profiles of the degree programme. Undergraduates have the opportunity to train and study at following partner universities: Lomonosov Moscow State University (Russian Federation), Babes-Bolyai University (Romania), Northern Arctic Federal University (Russian Federation), Nicolaus Copernicus University (Poland), Aix-Marseille University (France), University of Greiswald (Germany), V.S. Institute of Geology and Mineralogy. Soboleva (Russian Federation), Georgetown University (Malaysia), La Rochelle University of Science (France), University of Potsdam (Germany), University of Karachi (Pakistan), Purdue University (USA), University of Reading (UK), etc. In addition, students who have shown the best results participate in the competition for the presidential scholarship "Bolashak", which allows them to continue their studies at well-known foreign universities. Furthermore, students of the second and third semester have the opportunity to do a scientific internship abroad.

According to the SAR, the chemical study programmes can be characterized as international-oriented programmes and have cooperation with several universities and institutions in the world. Furthermore, the faculty organized joint centres of the university, for example, with the University of Rostock (Germany) and the International Center for Biological and Chemical Sciences of the University of Karachi (Pakistan).

As stated in the KazNU website, during 2018-2023, there have been several outgoings of the faculty of Chemistry, specially, for internships and short term stays in universities and research institutes in Europe, USA and Asia. According to the list of international students provided by the university, most international students come from Turkmenistan for the Bachelor's Degree programme in Chemistry. In addition, two students from Afghanistan are conducted the Master's programme 7M05301 Chemistry. Furthermore, the courses of the Faculty are offered in Kazakh, Russian and English languages. Every year, scientists and leading specialists from Germany, Great Britain, Finland, France, Japan, Russia, Pakistan, Sweden, the USA and other countries are invited to KazNU to hold lectures.

Relating the Master's degree "**7M01503 – Chemistry (ped.)**", academic mobility is carried out with the following partner universities: Research Institute of Institute of Means and Methods of Education of the Russian Academy of Education, Moscow State Pedagogical University, Moscow State University (M.V. Lomonosov), Belgorod State University, Russian State Pedagogical University, K. Albrecht University in Kiel (Germany).

For students of the **Bachelor's Programme "Pharmaceutical Manufacturing Technology"**, academic mobility is possible at the St. Petersburg State Chemical and Pharmaceutical University (Russia), with which an agreement of "Mutual Cooperation" has been signed. In

addition, teaching and scientific internships are planned at the Tashkent Pharmaceutical Institute (Uzbekistan), in a joint chemical laboratory at the University of Rostock (Germany) (within the framework of a cooperation agreement); in the joint Pakistan-Kazakhstan laboratory for innovative research and development of products based on plant materials at the International Center for Chemical and Biological Sciences of the University of Karachi (Pakistan) and at the University of Reading (UK).

During the audit, the students confirm the wide range of offers for academic mobility. They mention agreements with European universities and the Erasmus programme within the framework of agreements with European universities, for example, in Spain. Furthermore, they appreciate the state and faculty support in terms of scholarships. For instance, 17 scholarships are offered by the government for stays abroad based on a competition. The best bachelor's students have the opportunity to go abroad. Students can participate in projects and double degrees programme for one year. These stays are mostly paid by government and department. According to the present doctoral students, there are agreements with institutions in Israel and France for one semester research stays.

Altogether, the auditors are satisfied with the curricula of all programmes. They see that the programmes are well structured and that the modules build on each other in a reasonable way, enabling the students to effectively reach the learning outcomes as laid down for the programmes as a whole. Learning outcomes are also defined for each module, which, in total, enable the achievement of the overarching programme objectives. The electives offered in both programmes provide opportunity for individual focal points and courses of study. Furthermore, they appreciate that the curriculum is periodically reviewed.

Nevertheless, regarding the **Master's Degree Programme Chemistry (7M05301)**, the experts recommend to introduce more laboratory work hours. Although bachelor students have, according to programme coordinators and teachers, enough laboratory work during the bachelor's degree, the expert group considers, based on the industry partner's opinion, very important to increase the practical work in the Master's programme.

Regarding the **Master's programme Chemistry (ped.)**, the experts think that the teaching internship is a good method to prepare the students for their future profession as teachers. However, they recommend to introduce more practice and presentations in the courses of the Master's programme Chemistry (ped.), in order to develop the student's teaching skills. It could be considered if the teaching practice could be introduced not in the second semester, but later, when students are better prepared to undertake this task.

Furthermore, teaching practical training ability should be, according to the experts, intensified in the **Ma Chemistry (ped.) (7M01503)**. In addition, regarding the **Bachelor's programme Pharmaceutical Manufacturing Technology**, the experts recommend to increase

the synergy between the pharmacy programme offered by the Faculty of Medicine of KazNU and the programme under review of the Faculty of Chemistry.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report (SAR)
- Academic Policy
- University Website: <https://www.kaznu.kz/en>
- Information about admission requirements:
 - Bachelor in Pharmaceutical Manufacturing Technology, Bachelor in Chemistry: <https://www.kaznu.kz/ru/26808/page/>
 - MA Chemistry (ed.), MA Chemistry: <https://www.kaznu.kz/en/26810/page/>
 - PhD Chemical Engineering <https://www.kaznu.kz/en/26811/page/>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the Academic Policy of KazNU (approved by the decision of the Academic Council Protocol No. 1 from 29th September 2022), admission of new students to programmes offered by the university is carried out according to educational programmes of higher (bachelor's) and postgraduate education (master's, doctoral studies), included in the Register of educational programmes of the Center for the Bologna Process and Academic Mobility of the Ministry of Science and Higher Education of the Republic of Kazakhstan. In accordance with sub-paragraph 6) of paragraph 2 of Article 43-1 of the Law of the Republic of Kazakhstan "On Education", the University, determines a cut-off point for applicants, taking into consideration the specifics of the field of study.

The university has described the different admission criteria in their self-assessment report. These criteria differ for the admission in a bachelor, master and PhD program. As stated in the university's SAR, applicants for bachelor's degree programmes have to take the "Unified National Test" (UNT) as a nationwide university entrance examination. Participants receive a certificate including a test score with which they apply at their desired university. Based on the received applicants' UNT results, Bachelor candidates may participate in the selection process for the granting of a university scholarship provided from the state budget or the local budget and (or) enrol in paid education based on the result of the Unified National Testing (UNT). KazNU, in accordance with the applicable regulations, determines the passing score for a given intake and admits applicants who pass the determined

threshold. There is also a point's transfer scale for persons that present certificates of international standardized tests.

Acceptance of applications for master's and doctoral PhD programs is carried out online by the University Admissions Committee or through the information system. To apply, the applicant must register in the mobile database that create a Digital ID or digital passport that confirms your identity. After creating a digital passport, the applicant registers by filling in the required data. Additionally, students participate in the competition to receive an educational grant from the state of Kazakhstan. If the students are not successful in archiving state funding, they can alternatively register for a paid education. International grants by the government are available and calculated based on a quota. The acceptance of the students depends on their results of the initial test and the number of applications and capacity in the study program.

To continue doctoral studies, comparable competitive grants are available. This "Comprehensive Test" (CT) is conducted by the National Testing Center and is acknowledged by KazNU. Admissions of PhD students at KazNU are decided upon by the University's "University Admissions Committee" based on the results of the CT in combination with subject-specific entrance exams. Moreover, applicants for entering PhD studies need to have at least nine months of professional experience to be eligible for admission and require a certificate in English language. Additional requirements are possible for single study program. Students can appeal the results of the examinations at the ministry of foreign affairs, which leads to a new consideration of the decision by an additional. For Master's and PhD's candidates, there is a foreign language test for English, German or other languages. Persons in possession of one of the international certificates confirming knowledge of a foreign language in accordance with the pan-European competencies (standards) of foreign language are exempted of this requirement.

The admission requirements are, according to the university, published on the university website. The website should inform potential students in detail about the requirements and the necessary steps to apply for admission into the programmes. Since the rules are based on official regulations, the auditors deem them binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes.

Criterion 1.5 Workload and Credits

Evidence:

- Self-assessment report (SAR)
- Module handbooks
- Survey of student satisfaction related to the workload
- University Website: <https://www.kaznu.kz/en>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

KazNU uses a credit system for assessing the workload of students which is applied to all mandatory components of the degree course, including internships. Credits are awarded for every module based on the respective workload. The workload includes contact hours and time for independent work. As states in the SAR, one academic credit (ECTS) is equivalent to 30 hours, of which at least 9-10 hours are devoted to contact classroom work of students. The Bachelor's programmes contains 240 ECTS, the Master's degree 120 ECTS and PhD doctoral programmes 180 ECTS. The workload, separately for each module and course, is specified in the module handbook of each programme.

According to the SAR, the workload is regularly checked and updated, in particular, the issues of compliance with credits for each module, the actual workload of students and the distribution of workload over all semesters is carried out. During the Academic Committees, students, employers and the university are involved in this process. Adjustments and updates are documented and recorded the system of the Unified Higher Education Management System. Furthermore, the university explains that the workload allows for the full achievement of the planned learning outcomes in the standard period of study: for the Bachelor's degree - 4 years (8 semesters), the Master's degree - 2 years (4 semesters), and the PhD doctoral degree - 3 years (6 semesters).

During the discussions on-site, the experts ask the programme coordinators about the correctness of the graduation rate and standard period of study. They confirm that the results are too positive and they are planning to introduce new measure methods. In addition, the students express their satisfaction with the workload and the distribution of credits between the semesters. The experts are satisfied with the fact that the amount and composition of the workload are described in detail for every module in the module handbook. Furthermore, comparing the objectives and the content, the workload defined for the single modules in general seems to be realistic for the auditors.

Criterion 1.6 Didactic and Teaching Methodology
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Evidence:

- Self-assessment report (SAR)
- Module handbooks
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the SAR, KazNU apply various student-centred teaching and problem-based learning methods such as lectures, practicum, laboratory work, seminars and research studies. Lectures provide systematic and solid knowledge of the discipline and use power point presentations, videos and handouts. In seminars, individual presentation work as well as group work are very common, such as oral responses from students or reports from individual students or groups of students, summaries of research articles, debates or discussions of current issues, games and modelling, the use of models, role-playing games, the construction of diagrams, schemes or graphs. Some courses are interactive and use digital tools. During the laboratory work, students perform practical work and develop practical skills of collecting and processing samples and working with special equipment and learn to master the methods of analysis and synthesis, the ability to evaluate the results obtained and systematize them.

In the SAR, it is also emphasized that student's independent work is an important part of the learning process. For a successful implementation, the teachers ensure the motivation and concrete formulation of cognitive tasks as well as a clear definition of the amount of work, time of its submission and evaluation criteria. To support independent scientific work of students, they are provided with information and library services. Thereby, students have access to various international databases. In addition, questions for self-control and tasks for independent work are used in some courses to support independent work.

During the audit, members of the teaching staff explain the experts how they train soft skills in the courses. In the area of scientific research for Master's students, for instance, students have to prepare three different types of presentations and also poster presentation. In Bachelor's programmes, scientific writing is practiced. According to the teachers, the most of them play the role as advisors and organized cultural events and meetings between teachers and students, in order to develop soft skills, for example, communicative skills and team work. The interviewed students confirm this and express their satisfaction with these didactic methods. They state that they have practical teaching hours within the framework of the pedagogic internship. They have also to prepare and to present short presentations and poster (5-15 minutes). For instance, in some seminars, there is team work and competition between groups to argument and defend a subject.

The experts appreciate the diversity of teaching methods and believe that they ensure that the course objectives and the overall intended learning outcomes are achieved. Nevertheless, the experts stress that the provided documents are no matrices. The University should provide a table, which didactic method is used in which module / which exam type is offered in which module / which synthetic method or reaction mechanism is taught in which module or experiment in the lab modules. This will provide a very quick and comprehensive view on the teaching methods, exams and practical methods and will help them to improve their teaching portfolio.

Moreover, the expert group discuss the methods to develop the teaching abilities of students of the Master's programme Chemistry (ped.). The programme coordinators explain that they have a teaching internship in the second semester. Thereby, they should acquire and consolidate their teaching skills, methods for the preparation of a subject and the organization of the course activities. The experts find the teaching internship a good method to prepare the students for their future profession as teachers. However, they recommend to introduce more practice and presentations in the courses of the Master's programme Chemistry (ped.), in order to develop the student's teaching skills. It could be considered if the teaching practice is introduced not in the second semester, but later, when students are better prepared to undertake this task.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:

KaZNU states in its response statement that additions will be made to the modules description catalogues and each module description will be provided by specific and clear learning outcomes. The university has also sent an example presented in Appendix 1. The auditors appreciate that these measures are taken by the university. Furthermore, regarding the lack of content in the curriculum on registration of drugs and GMP, KaZNU explains that students of the Pharmaceutical Manufacturing Technology programme study all the regulatory requirements of appropriate GXP practices (GMP, GPP, GLP, GDP, GVP). The HEI plans to conduct an additional survey among students and employers, based on the results of which, if necessary, the content of the relevant disciplines will be adjusted. The experts appreciate these efforts and commitment of the university. Nevertheless, as this process is beginning and not already finished, the expert group sticks to their previous assessment and consequently to the recommendation for the Bachelor's degree programme Pharmaceutical Manufacturing Technology (E5) which still has to be fulfilled.

Concerning the expert's recommendation to increase the laboratory hours in the Master's Degree Programme Chemistry, KaZNU states that, although laboratory classes are not provided in Master's degree Program Chemistry (7M05301), undergraduates acquire practical

skills in the course of research practice (9 credits) and of the completion of research and master's thesis (24 credits). In addition, during the internship, undergraduates get the opportunity to master new modern research methods in the universities abroad as well as in domestic advanced research centers. However, the experts believe that training practical skills and the introduction of more laboratory hours in the Master's degree Program Chemistry (7M05301) is necessary. Therefore, the recommendation **E6** remains.

The expert's suggestion of introducing the teaching practice later than the second semester of the Master's program Chemistry (ped.) has, according to KaZNU's statement, already been taken into account. The teaching practice has been moved from 2nd to 3rd semester and this will be considered for the new admission of 2023. The experts appreciate this immediate reaction of the HEI. However, the experts' suggestion to introduce more practice and presentations in the courses of the Master's program Chemistry (ped.), in order to develop the student's teaching skills (**E7**), has to be fulfilled.

Moreover, regarding the synergy between the pharmacy program offered by the faculty of Medicine of KazNU and the program under review of the faculty of Chemistry, KaZNU responds that within the existing limitations, due to the fact that these programs have different learning objectives, the interaction between the faculties still exists. For instance, to create high-quality and safe medicines, the Bachelor's program Pharmaceutical Manufacturing Technology includes: "Fundamentals of Pharmacology" (classes with students are conducted by lecturers from the Department of Pharmacology of Kazakh National Medical University); classes on "Physiology and basics of anatomy", "Screening and preclinical studies of pharmaceuticals", "Microbiology and virology" are conducted by lecturers of the Faculty of Biology and Biotechnology of KazNU. The university will try to find additional interactions as part of the preparation of students in areas. The auditors understand these explanations and appreciate these measurements. Nevertheless, they are of the opinion that more cooperation and collaboration with the medical faculty concerning the pharmaceutical programme should be intensified. Therefore, the auditors sticks to their previous assessment and consequently to the recommendation (**E4**) which still has to be fulfilled.

In addition, KazNU explains that they are working on the transition of the website to a new platform and that, in summer, a new website of the university will be launched. Therefore, there are sometimes interruptions and some pages might not be opened. They provide working links to the pages of the faculty website, where up-to-date information about the admission requirements can be found. The experts are grateful for that and could access to the information. Furthermore, KaZNU provided a table containing didactic methods and exam types per each module as well as an overview of the synthetic method or reaction mechanism taught. The peers appreciate this, but they are of the opinion that this matrix

is not detailed enough. It cannot be assessed how extensively students learn different methods and synthesis mechanisms in the practical course.

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, concept and organisation
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Evidence:

- Self-Assessment Report (SAR)
- Academic Policy (<https://www.kaznu.kz/content/files/pages/folder20484/Academic%20policy.pdf>)
- Module Handbooks
- Samples of student’s work (projects, exams and thesis)
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Exams in the degree study programmes under review follow the examination rules as stated in the Academic Policy of KazNU. According to this, various examination methods can be applied. To assess the achievement of the learning outcomes of one module, the main procedure is a combination of “current control”, “boundary control” and “final control (final exam).” The “current control” considers the systematic testing of the students’ knowledge in accordance to the syllabus. This method considers activity in the classroom and extracurricular work (including homework). Information on current control methods is mentioned in the syllabus in the online “univer” system. Formative assessments are held in the form of two so-called “milestone controls”, each covering one-half of the semester syllabus. To pass this examination, students need to obtain an average of at least 50 % to be admitted in order to participate in the final course examination. The final assessment takes the form of a comprehensive exam. Alternative examinations are possible for online lectures and will be communicated with the students accordingly.

The standard assessment methods of KazNU apply a 100-point scale as following table shows. Students to fail to pass a course may retake the course, subject to the applicable reasons and regulations (e.g. previously failed examinations, violation of exam conditions, etc.).

Letter grade	Grade Point Value	Percentage	Conventional Grade
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C Peer Report for the ASIIN Seal

A	4.0	95-100	Excellent
A-	3.67	90-94	
B+	3.33	85-89	Good
B	3.0	80-84	
B-	2.67	75-79	
C+	2.33	70-74	
C	2.0	65-69	Satisfactory
C-	1.67	60-64	
D+	1.33	55-59	
D	1.0	50-54	
FX	0.5	25-49	Failure
F	0	0-24	
I (Incomplete)	-	-	"Incomplete" (not included in your GPA calculation)
AU (Audit)	-	-	"Audit" (not included in your GPA calculation)
Cert.	-	30-6050-100	"Certification" (not included in your GPA calculation)
Uncert.	-	0-290-49	"Uncertification" (not included in your GPA calculation)
R-difference	-	-	"Discipline difference on curriculum" (not included in your GPA calculation)

The Dean's office of the faculty, the Center for Situational Management, DAV and the Office of the Registrar Responsibility are responsible for the organization of the examinations. The students are informed on the applied assessment methods in their syllabus and at the beginning of the lecture. The Center for Situational Management of the University controls and monitors compliances regarding examinations. If students have an "unsatisfactory" grade corresponding to the "FX" grade (25-49), they are allowed to retake the exam once on a paid basis. In this case, a retake of the entire course is not mandatory, with the exception of an unsatisfactory grade in a discipline of the elective component. Students can choose between re-study the same discipline in the prescribed manner or replace it with another elective discipline from the same component. Grades "AU", "F" can be changed by re-passing the discipline. Students are allowed to retake an exam with an "FX" grade is only once.

According to the handbooks of the study programmes under review, the experts take note that the courses include mostly written exams. For instance, the courses of Master's programme Chemistry (ped.) include following distribution of the examinations: 9 written exams, 1 report, 1 oral exam and 1 project for pedagogics. During the audit, they discuss with the teaching staff which other exam forms they are applying in their lecture. They learn

that in Bachelor' programmes, there are, basically, written exams and in Master's degree and PhD more project work. The lecturers are of the opinion that writing exams enable more easily to control the progress and knowledge of students. They explain that they can choose the examination form. Oral exams are in their opinion adequate for small groups. Some teachers prefer to combine oral and written exams in their courses. Nevertheless, the teachers emphasize that they are working on introducing more oral examinations. On the other side, the students express their satisfaction with the examination forms and organization. They state that they prefer written examinations, since these are more comfortable for them. The experts learn from their explanations that the teachers inform clearly and timely the students about the examination form.

Regarding the final thesis or project, students may choose a supervisor or advisor and the topic of their thesis, as well as are allowed to change the approved supervisor or advisor and/or topic of their final work based on the relevant application. Bachelor's and Master's students have to write and defend a final thesis. Students, who have fully completed the required courses and who have been admitted to the defence of their final thesis by the supervisor, are allowed to this examination. In addition, at least one scientific publication to the master's thesis subject have to be published. A mandatory check for plagiarism is carried out in the UNIVER system before the defence.

The thesis defence takes place in a session of the "Attestation Committee (AC)" that are publicly announced and open for all interested. In the case of Master's thesis, the "certification commission" decide the final grade of the by majority of votes of the commission members participating in the meeting.

The experts take note that the Exam-Rules correspond to the year 2022-2023 and wonder whether these regulations change each year considering that one month period of publishing before the exams would be very short. In addition, they are missing examination rules for each programme.

The auditors review the exam and thesis samples provided by the HEI. According to them, the documents prove that the level of the students' academic performance and the modules' contents is sufficient for the respective programme. Furthermore, they are of the opinion that the number and distribution of exams ensure an adequate workload as well as sufficient time for preparation. However, the experts are of the opinion that especially the Master's programme Chemistry (ped.) due to the focus in the area of pedagogic should integrate more oral examination types such as presentations and simulation of teaching situations.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:

Regarding the examinations rules, KaZNU states in its response to the preliminary assessment that the examination rules are revised and published every academic year before exams. The university also explains that the rules are specific only for different types of exams, but not specific for each programme, because the examination rules are unified for all degree programs at the university. In order to effectively organize the examinations for each discipline, an exam program is developed (based on a general program (examination rule) in accordance with the type and form of the exam and depending on the platform on which the exam is conducted). These programs are considered by the methodological council and approved by the head of the department. In addition, the program is placed in the UNIVER system in open access for students. The peers appreciate these explanations.

Furthermore, regarding the auditors' suggestion to increase oral examination forms in the curriculum of the Master's programme Chemistry (ped.), KaZNU states that the programme includes 10 written exams and 9 oral types of exams (case studies, reports, projects) and that, in the future, according to the experts' recommendation the share of oral exams will be increased. Due to the focus in the area of pedagogic, the auditors appreciate that the university take this measurement and are of the opinion that this recommendation (E7) has still to be fulfilled.

3. Resources

Criterion 3.1 Staff and Development
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Evidence:

- Self-assessment report (SAR)
- Staff handbook
- Annex - Professional development of staff over the past 5 years
- Annex - Awards and achievements of staff
- Annex - Courses of invited foreign professors
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the SAR, the faculty of Chemistry of KazNU consists of 116 teachers. From them, 46 are employed as associate professors, 18 as senior lecturers, 19 as lecturers and five as teaching assistants. Additionally, leading employees from companies, scientific organizations and international scientists are invited by the faculty and departments to impart courses. According to the staff handbook, most of the teaching staff are holder of a PhD degree. Apart from their teaching activities, most of the teaching staff carry out scientific and applied research in various fields of chemical and technical sciences.

The selection of personnel is determined on the basis of an open competition for vacant positions taking place during summer period. This competition takes into account education, experience, scientific achievements, scientific publications, awards and other achievements, the participation in national and international projects, and position in the university ranking. The staff rating is also an incentive for the constant development of staff in various directions. During the on-site discussion with the rectorate, the auditors learn the competition procedure is open for everyone and that the university is working on inviting professors and lecturers from abroad. The representative from the rectorate explain that requirements for the position as professor are holding a PhD degree, several publications in recognized journals and broad experience in research activities as well as communicative and team competencies. Furthermore, they pay attention to the feedback of the students about the active professors.

Regarding workload of the teaching staff, the programme coordinators explain that the lecturers can choose to invest more time in research activities and in this case, fewer teaching hours. Accordingly, their salary depends on teaching work. During the audit, the lecturers highlight that they like this flexibility, because they can distribute their time according to their needs and have enough time for research work. Furthermore, the lecturers learn that there are teachers specialized in teaching in specific languages (Kazakh, Russian and English). The students can choose the courses in the language they prefer.

The teaching staff can improve their professional skills at The Institute for Advanced Studies which offer different activities. The lecturers are satisfied with the support and offers from the university to further develop their professional and didactic skills. During the audit, they emphasize that during the pandemic, the university has offered courses for digital learning to learn new teaching methods. Furthermore, there are workshops for advisors and conferences about pedagogic methodologies and teaching methods. In addition, there are several financial supports programmes for professors. For instance, 500 grants for the whole country for 12 months stays abroad are offered by the government. Although the competition is difficult, they believe that this a very good financial support. They state that the university do not offer research sabbatical or similar opportunities.

Support and assistance for students

KazNu and the Faculty of Chemistry have implemented a series of instruments supporting students in the learning process and monitoring their success in reaching academic goals and the assigned learning outcomes of both programmes. Annually, 1000 excellent students of socially vulnerable categories, and athletes are provided with discounts on training from 10-25 %. The university offers also preferential vouchers to health camps and boarding houses; free medical care at The Medical Center and part-time work in the structural divisions of the university.

For instance, scientific supervisors of master students assist them not only in realization of master thesis, but to find the most suitable organization for long-term or short-time internships. During the internship, they support also the students to solve the necessary problems, together with the local co-supervisor, who helps solving local needs. The main information service for students and their parents to monitor current progress is the “Univer” system, which was created to support the processes of assessing students' knowledge, conducting examinations using computer tests, filling out an electronic journal of attendance, ongoing and final monitoring of students' knowledge, etc. Furthermore, advisors assigned to the students monitor the progress of learning and counsel students about courses, electives, track and further questions, in order to determine the adequate credit load for each semester and to find out solutions for problems related with the student's achievements. Students confirm in the discussion with the auditors that the advisory system works very well, that they meet their academic advisors regularly and that they always may contact them personally for support or advice. In general, students stress that the teachers are open minded communicate well with them and take their opinions and suggestions into account and changes are implemented if necessary.

In conclusion, the auditors are of the opinion that the faculty has sufficient human resources and organisational structures. Therefore, individual subject-specific and general counselling, supervision and support of students as well as administrative and technical tasks are ensured. The allocated advice and guidance on offer assistance to the students in achieving the learning outcomes and in completing the course within the scheduled time are adequate. They recognize that the teaching staff is qualified enough and very engaged. Furthermore, they estimate very positively the support of the university and faculty for the didactic training and scientific development of the lecturers. They notice that there are enough resources available to provide individual assistance, advice and support for all students.

Criterion 3.2 Funds and equipment
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Evidence:

- Visitation of the university and laboratories
- Self-Assessment Report (SAR)
- Discussions during the audit

Preliminary assessment and analysis of the peers:

During the audit, the experts ask about the distribution of the budget of the university. The representatives of the Rector's Office explain that the income of KazNU comes from the ground funding from the government and from educational services. The income plan depends on the students admitted to the university. Based on this, an investment plan is designed for each department. Each study program receives their budget from the Republic of Kazakhstan and additional organisations and funding agencies. Facilities and infrastructure, human resources, development, including lecturer and staff, academic and education operational costs, consumables as well as student activities and development are considered in the budget. 15% of grant funding is planned for scientific projects of the Republic of Kazakhstan. Most projected investments deal with new laboratories and the infrastructure of the campus. The university plan to raise the salary of the teacher staff and to develop strategies for supporting students. They emphasize that the financial situation of KazNU is stable. New dormitories, educational and administrative buildings and guest houses and scientific center are planned to be built.

Students, who does not receive a state scholarship, has to pay tuition fees in order to study at KazNU. According to the SAR, 95 % of the students of the Faculty of Chemistry and Chemical Technology receive a state scholarship for their studies. For students who have received "excellent" grades, an increased scholarship is awarded. In addition, KazNU also offers nominal scholarships, for example, Birimzhanov B.A., Songin O.A., Kozlovsky M.T. scholarships etc. for significant achievements in the field of science, arts, and public life of the university. The current tuition fee for bachelor's degree on a paid basis is 1,000,000 tenge, for Master's degree 1,350,000 tenge and for PhD degree 2,200,000 tenge per student per academic year.

The university has a large main campus, where fourteen dormitories offer more than 5,000 places to their students. It is also planned to build new dormitories. Housing is offered to the teaching staff to support visiting professors. In addition, KazNU offers free medical care for students and faculty in a diagnostic centre on campus, which is operated in cooperation with at the Yonsei University in Seoul (Korea). The access to Wi-Fi is available across campus. The university library has physical and electronic journals and books accessible for students via databases. The Faculty of Chemistry has one Conference Hall, nine auditoriums of different sizes, 17 auditoriums for seminar or lectures and four seminar rooms as well as

four computer rooms and 62 laboratories. The classrooms used for lectures and seminars are equipped with projectors and some have interactive whiteboards and Internet access.

During the on-site visit, the experts visit the facilities of the university and the faculty as well as the laboratories. Following laboratories are inspected by the experts:

1. Practice Laboratory: Technology / Manufacturing
2. Laboratory for polymeric chemistry
3. Smaller Laboratory for Master's Students
4. Physical Chemistry
5. Laboratory of Chemical Engineering
6. Organic Chemistry department: Analytical Chemistry
7. Laboratory for electrical chemistry
8. Research Center of Medicinal Plants
9. Laboratory for Physical Chemistry
10. Physical Technology and materials
11. Laboratory of Chemical production and agrotechnology
12. Center of Physico-Chemical Methods of Research and Analysis
13. Research Institute for New Chemical Technologies and Materials

Altogether, the experts conclude that the university has secure funding and reliable financial planning. The facilities and infrastructure as well as the dormitories offers are very good and adequate. In the opinion of the experts, the Research Center of Medicinal Plants is very well equipped and offer excellent conditions for researching.

Regarding the teaching laboratories, the experts conclude that the basic equipment is good and adequate to train students and enable them to achieve the ILOs of their respective degree programs. However, they think that specialized equipment could be improved e.g. more equipment for basic process engineering operations like distillation, extraction, mechanical separation techniques; NMR-Spectrometer (benchtop); magnetic stirrers, automatic titrators, automatic vacuum controller. Furthermore, during the tour of the laboratories, they note that the safety conditions have to be increased according to international standards. For instance, safety glasses were not worn neither by teacher nor by students. In addition, the language of the descriptions and indications and the labelling of the stored chemicals has to be in different languages and the chemicals should be labelled with the international hazard symbols. Fire extinguishers have to be fixed to the walls not be left standing on the floor and gas cylinders should be attached to avoid accidents. The labs in which dangerous chemicals are handled (organic and inorganic chemistry) could be equipped with more fume hoods.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:

The experts appreciate that KaZNU provides a response to this recommendation regarding laboratories' safety conditions. In its statement, the university emphasize that safety glasses and gloves are worn during the experiments. However, according to the peers, protective goggles must be worn not only during experimentation but while in laboratories. Furthermore, the university agrees with the recommendation of translating the descriptions and indications, since there are foreigners studying in the Faculty. KaZNU is committed to meeting all international standards on safety conditions before 2023-2024 academic year. The auditors appreciate the university's efforts and commitment to improve the safety conditions of the laboratories according to the international standards. However, as this process is beginning and not already finished, the expert group sticks to their previous assessment and consequently to the recommendation **E1** and the requirement **A1** which still has to be fulfilled.

4. Transparency and documentation

Criterion 4.1 Module descriptions
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Evidence:

- Self-assessment report
- Module handbook of each study program
- University Website:
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The module handbooks are accessible, according to the University, to all students and teaching staff and contain following information: module identification code, the person(s) responsible for each module, training method(s) and workload, credit scores, expected learning outcomes, module content, planned use/applicability, entrance and examination requirements, form(s) grades and details explaining how the module score is calculated, recommended literature, the date of the last amendment. The university additionally uses a syllabus, which is available for all students within the "Univer" system. Short descriptions of all elective and compulsory modules are further available on the university website for each study program.

During the discussion on-site, the students interviewed seem to be satisfied with the Univer system. They think that it is very useful and easy to use. They state that they can find all important information and the information about electives and courses by each department and teachers. During the audit, the experts can confirm that the Univer contains the main information about the programmes and curriculum. However, the auditors observe that the complete detailed module handbooks for the respective programs do not appear to be publicly available on the University/Faculty's website and recommend to introduce this information in the university website. In this way, all the stakeholders and interested candidates can access to this information.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Self-assessment report
- Samples of diploma supplements:
<https://www.kaznu.kz/en/26168/page/>
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The university states that shortly after graduation, each student receives a diploma together with a diploma supplement and a transcript of records. Documents are issued in Kazakh, Russian and English. The diploma supplement describes level, context, content and status of the studies that were pursued and successfully completed. The total amount of credits, PLOs the grade and grading system as well as information about the educational system. The transcript of records contains information and grades for each module separated to the semester in which it was completed. Internships are listed showing the period of practice, awarded credits, workload hours and grade. The grading system is explained to third parties.

The experts based on the samples of these documents confirm that the students of the programmes under review are awarded a Diploma Supplement as well as a Transcript of Records and these contain all the required information.

Criterion 4.3 Relevant rules

Evidence:

- Self-assessment report (SAR)
- University website: <https://www.kaznu.kz/en>
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The university website contains the main information about the programmes and regulations. In addition, the organisation of the study program is supported by the online platform “Univer.” Within this system, student can access their study plan as well as the syllabus of each module. In addition, all rules and guidelines can be viewed and downloaded in this system. The rights and obligations, such as guiding principles, regulations, and charters, are available on their webpage for all third parties. Basic information on all courses offered at KazNU are presented on the webpage as well.

The expert panel confirms that relevant documents such as the University’s Academic Policy, students’ and staff’s rights and duties or quality management guidelines exist and are published publicly on the university’s website. However, the experts observe an inconsistent use of the English translations of multiple programmes under review, and that the complete detailed module handbooks for the respective programs do not appear to be publicly available on the Faculty’s website. Concerning the latter, a summative overview on the Faculty’s website such as the one provided by a neighbouring Faculty here is encouraged.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:

KaZNU states in its response that the detailed module descriptions (name of the module, aim of the module, assessment policy, etc.) are available in the Univer system as well as on the University website. They explain that the module descriptions can be found in the pop-up windows of the website. The experts appreciate these explanations. After revision of the links provided by the university, they could see that information about mandatory disciplines and electives can be found in the pop-up windows. However, they recommend to include the complete detailed module handbooks for the respective programs in the Faculty’s website. Therefore, the recommendation **E3** remains unchanged.

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-assessment report (SAR)
- Samples of survey questions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

As a national university, KazNU has to follow guidelines by the Republic of Kazakhstan and the Ministry of Science and Higher Education. The internal quality assurance policy of KazNU complements the state regulations; the university has issued several additional documents such as an academic policy, policy of academic honesty, policy for assessing learning outcomes and regulation on the procedure for the development and approval of educational programs. The representatives of the rector's office describe during the on-site visit that each faculty has their own Academic committee, who is responsible for the quality assessment of the study programs. They are also the group in charge organize the different kinds of evaluations, analyse the results and initiate improvements in the quality of the program. Answering the questions of the expert panel, the representatives of the rector's office confirm that all surveys are conducted anonymously. The majority of surveys are done online. The representatives of the rector's office further state that external stakeholders are also integrated in the quality assurance processes and receive their own questionnaires.

The Academic Committees for each programme are composed by students, teachers and university members as well as employers. They are involved in the process of checking and updating the study degree programmes offered by the university, in particular, the issues of contents, credits for each module, and student's workload in accordance with the rules for developing educational programmes. Adjustments and other information on updating programs are documented and introduced in the Univer system. This internal evaluation considers among other things, the demand on the labour market, the fulfilment of the learning outcomes at graduation in reference to the Qualification Framework, the transparency of all processes of teaching, learning and evaluations, to provide the graduates the academic knowledge and necessary skills (including soft skills) to work in their future occupations, and to affect the personal development of each student. Thus, each educational program is under constant monitoring in a three to five year cycle. Annual revision of the educational programs are performed during autumn, in which data is collected and analysed. If the need for change is evident, implementations take place in the following year. Reports are forwarded to the members of the board (Vice-Rector of Academic Affairs, Academic Council) for the decision process.

For the teaching or courses evaluation by students, online questionnaires available in “Univer” system are used. Students grade their teachers with 1 to 5 points on 25 categories concerning aspects such as study material, appearance of the teacher, corruption, teaching quality, relevance of content, etc. The results are controlled by the chair and regularly discussed with the respective teachers who always have access to all detailed results of their evaluations. A calculated average total grade is made public on the teacher’s website in order to guarantee transparency. If the general grade is below 3 a discussion with the chair is compulsory and improvement measures are agreed on. These evaluations take place each semester.

The auditors ask the programme coordinators and lecturers about the quality process after the teaching evaluation. The experts learn that the lecturers discuss the results with the head of the department and the dean and head of department can meet students and, in case of problems or conflict, discuss with the students and look for solutions and measurements. Students can also consult the advisors and express their dissatisfaction or speak about problems.

Surveys among other stakeholder are also be conducted through questionnaires that are send, for example, to employers to evaluate their satisfaction with the competences of the graduates on the labour market. In addition, new questionnaires among recent alumni are currently developed to verify the satisfaction of their entire study progress at KazNU. External quality assurance at KazNU involved institutional and specialized accreditations, consideration of the institutional ratings of the university and each study program and a certification of the quality management system.

During the audit, the experts note that the present students are not well informed about the Academic Committees and their function and composition. Therefore, they think that the university should include more actively students in the Academic Committees and broaden the information about this process. Students should participate and cooperate more in the process of developing and monitoring the university’s degree programmes. In addition, the students state that the teachers do not discuss the results of the teaching evaluation with them in the courses. Only the advisors seem to do this. The lecturers are asked by the experts about the evaluation too and they appear to be not clear about the process. The auditors appreciate the direct communication between advisors and students. Nevertheless, the auditors conclude that the students have to be included more actively into the feedback loops of the university quality management system and after the teaching evaluation, the teacher of each evaluated course should discuss the results with the students.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:

KaZNU agrees that students have to be more actively included into the feedback loops of the university quality management system and after the teaching evaluation. Furthermore, they recognize that the teacher of each evaluated course should discuss the results with the students. They explain that a new system of comprehensive assessment of the teacher and educational programmes is being developed, and student surveys on satisfaction with university's programs will be conducted more frequently. Teachers will be encouraged to introduce mandatory discussion of the course with students. The experts appreciate that the university takes these measurements. However, they judge this requirement (A2) to be not fulfilled yet.

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Criterion D 1 Research

Evidence:

- Self-assessment report (SAR)
- Module Handbook
- Discussion during the audit

Preliminary assessment and analysis of the peers:

According to the PLOs of the **PhD Chemical engineering**, the main purpose of the programme is training research and scientific-pedagogical personnel in the field of chemical engineering, who are able to independently plan and conduct scientific research and to present the results of their research in scientific discussions and publications, in order to solve actual problems in the field of chemical engineering developing new cost-effective technologies and schemes for the production and processing of substances and materials with desired properties.

As stated in the SAR, the Faculty of Chemistry and Chemical Technology has implemented more than 100 research projects during 2022 and is leader within the university in terms of the number of implemented grant and program-targeted projects financed by the Ministry of Education and Science of the Republic of Kazakhstan. PhD students are also actively involved in the implementation of research and successfully publish the results of their research. As the university emphasize, the high quality of the research results is confirmed

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by the growth of publications in journals indexed by the Scopus and Web of Science databases, especially in Q1-Q2 (Web of Science) journals, which have a CiteScore percentile of more than 50 (Scopus). Following overview shows information and publications of Chemical Engineering PhD students in 2022:

Kapar Anel; Muratuly Aset; Orazbayeva Dina; Bakaikina, Nadezhda; Bukenov, Bauyrzhan; Kenessov Bulat	Modeling the effect of temperature on solid-phase microextraction of volatile organic compounds from air by polydimethylsiloxane coating using finite element analysis	Analytica Chimica Acta DOI 10.1016/j.aca.2022.339431 Q1
Bulat Kenessov and Anel Kapar	Optimization of headspace solid-phase microextraction of volatile organic compounds from dry soil samples by porous coatings using COMSOL Multiphysics	CHEMRXIV Preprint
Abdimomyn S.K., Abdakhytova D.A., Zhigalenok Y.R., Khavaza T.N., Kurbatov A.P.	Role of carbon material surface functional groups on their interactions with aqueous solutions	Journal of Electroanalytical Chemistry– V. 922. - 116707 https://doi.org/10.1016/j.jelechem.2022.116707 Q1
T. Khavaza, Z. Ibraimov, S.Abdimomyn, D.Abdakhytova	Phosphogypsum conversion under conditions of SC-CO ₂	Journal of CO ₂ Utilization. – V. 63. - 102120 https://doi.org/10.1016/j.jcou.2022.102120 Q1
Zhigalenok, Yaroslav; Kokhmetova, Saule; Malchik, Fyodor; Starodubtseva, Alena; Galeyeva, Alina; Kurbatov, Andrey	Simulation of Intercalation Processes in Poorly Conductive Materials	ECS JOURNAL OF SOLID STATE SCIENCE AND TECHNOLOGY Q3
Malchik, Fyodor; Maldybayev, Kaiyrgali; Kan, Tatyana; Kokhmetova, Saule; Kurbatov, Andrey; Galeyeva, Alina; Tubul, Nufar; Shpigel, Netanel; Djenizian, Thierry	Application of a conversion electrode based on decomposition derivatives of Ag ₄ [Fe(CN) ₆] for aqueous electrolyte batteries	RSC Advances DOI 10.1039/d2ra00617k Q2

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S. Abdimomyn, D. Abduakhytova, T. Khavaza	Investigation of the functional layer formation on the surface of carbon material	Studia Universitatis Babes-Bolyai Chemia (In Press) Q4
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The curriculum of the structured doctoral programme focuses on developing skills for PhD's research activities. A module called "Research" (49 ECTS) includes "Graduate Seminar", "participation in international scientific conferences", "publication of the main scientific results of the dissertation in scientific journals" and "scientific Internship". In the graduate and research seminars held at the end of each academic year, students present the results of their educational and research activities. The scientific internships allow the students to exchange experience with foreign colleagues and carry out part of their research projects in advanced centers abroad. The results of internships and practices are presented by students in the form of reports and speeches at a meeting of the department.

Furthermore, the cycle of core disciplines (15 ECTS) is aimed at developing the skills of scientific writing and conducting high-quality scientific research at a high international level. The module offers a scientific and methodological base. This module includes Teaching Practice (10 ECTS). In addition, they can choose between two elective disciplines in the module "Aspects of teaching modern technologies of chemical engineering": "Modern trends in chemical engineering" and "Modern high-energy electrochemical systems". The "Project Management module in research work" (15 ECTS) aims to apply breakthrough theories of chemistry and chemical engineering in the creation of new chemical products. Furthermore, the cycle of major disciplines includes two elective modules (10 ECTS): "Module of IT-technologies and breakthrough trends in chemistry" and "Module of electrochemical engineering". The disciplines of these modules allow to form the ability to use modern software in scientific research and simulate chemical and chemical-technological processes.

During the audit, the present PhD students express their satisfaction with university's support and infrastructure for research activities. Some of them are working in international research groups and participate actively at conferences and research colloquiums as well as in paper publications. In addition, the representatives of the rectorate explain that 10 % of the grant funding goes to the support of PhD students. They highlight that, in the doctoral programmes of the university, the most credits are intended for research work. Moreover, there are scholarships for PhD students. Based on that, the experts believe that the focus of the programme enable doctoral candidates to broaden their skills and network for their research activities. In addition, they observe that the university provides good conditions and support for PhD's research projects.

Criterion D 2 Duration and Credits

Evidence:

- Self-assessment report (SAR)
- Module Handbook
- Academic Policy
- Sample of Dissertation
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The structured PhD programme Chemical Engineering has a duration of six semesters and include 180 credits. The programme is offered since 2019, but only since 2021, there are enrolled doctoral students and one of them has already finished. According to the SAR, for the period 2019–2022, there were no problems regarding the estimated time of completion of the PhD. Currently, four doctoral students are enrolled, as following table shows:

8D07102 - Chemical Engineering										
	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	
Information for applicants	0		0		0		3		4	
graduation	0	kaz: rus: en:	0	kaz: rus: en:	0	kaz: rus: en:	1	kaz: rus: en:1		kaz: rus: en:
expelled	0		0		0		2		1	

The doctoral students express unanimously that three years are enough time for the PhD programme. Furthermore, they explain that the PhD internship has a duration of approx. three months and they are very satisfied with this opportunity to work abroad and on international projects. During the on-site visit, the experts can revise some samples of dissertations defended in the faculty. Although there are currently a small number of students

enrolled in this program, the experts are of the opinion that the doctoral programme operate within an appropriate time duration.

Criterion D 3 Soft Skills and Mobility

Evidence:

- Self-assessment report (SAR)
- Module Handbook
- Academic Policy
- Discussion during the audit

Preliminary assessment and analysis of the peers:

As mentioned above, the doctoral programme in Chemical Engineering includes a scientific internship that is carried on abroad. PhD students can independently choose the place of internship and have the opportunity within the framework of agreements to do an internship at following universities: Belgorod State National Research University (Russia); Babes-Bolyai University (Romania), Nicolaus Copernicus University (Poland), Aix-Marseill University (France), Greiswald University (Germany), Georgetown University (Malaysia), La Rochelle University of Science (France), Potsdam University (Germany), University of Karachi (Pakistan), Purdue University (USA), University of Reading (UK), M.V. Lomonossov Moscow State University (Russia); St. Petersburg State University (St. Petersburg); Iowa State University (USA); Institute for the Development of Nanomaterials and Innovations of the University of Memphis (USA); Imperial College (England); Hojateppe University (Turkey); University of Oldenburg (Germany), University of Rostock (Germany), Marseille University (France), Valencia Polytechnic University (Spain). In addition to those offered, students. Problems and disagreements arising from the organization of internships are resolved by concluding an agreement between Al-Farabi KazNU and the proposed place of internship.

Following overview gives information about scientific international internships of doctoral students of the faculty:

№	Full name of a doctoral student and a domestic scientific consultant	Specialty, course	Foreign scientific consultant (degree, title, place of work)	Internship country City, University	Internship terms, duration	Ranking of Universities/Research Institutes (QS WUR, Times Higher Education WAR, Scimago Institutions Rankings)

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1.	Dzhumanova R.Zh., Rakhymbai G.S.	8D07102 Chemical Engineering	Florence Vaccandio, PhD, Aix-Marseille University	Aix-Marseille University, Marseille, France	5.03.2022-19.05.2022	QS WUR, 401-450, Times Higher Education WUR 301-350, Scimago Institutions Rankings 216
2.	Akanova G.Zh., Kamysbaev D.Kh.	8D05301 Chemistry	Akcil Ata Utku, Ph.D., Professor	Suleiman Demirel University, Isparta, Turkey	14.02.2022-14.05.2022, 3 month	QS 300, 1201+ (Times Higher Education WUR), 72 (Scimago Institutions Rankings)
3.	Bukenov B.O., Kenesov B.N.	6D060600 Chemistry, 3 course	Kosyakov D.S., Ph.D., Director of the Central Research Center "Arctic" of the M.V. Lomonosov Northern (Arctic) University, Arkhangelsk, Russia	Russia, Arkhangelsk, M.V. Lomonosov Northern (Arctic) University	November 15, 2021 - March 5, 2022 (3 months)	740 in Scimago Institutions Rankings
4.	Khavaza T.N., Tokpayev R.R.	8D07103 - Chemical Technology of Explosives and Pyrotechnics, 3 c.,	Graziella Liana Turdean, habil. dr. eng., professor, "Babes-Bolyai" University, Faculty of Chemistry and Chemical	Romania, Cluj-Napoca, "Babes-Bolyai" University	From 07.02.2022 to 27.04.2022	(QS WUR (451-500)), Times Higher Education WUR (1001-1200th 2023), Scimago Institutions Rankings (Chemistry 777)
5.	Abduakhitova D.A., Nauryzbayev M.K.	8D07103 - Chemical Technology of Explosives and Pyrotechnics, 3 c., в	Graziella Liana Turdean, habil. dr. eng., professor, "Babes-Bolyai" University, Faculty of Chemistry and Chemical	Babes Boiai University, Cluj-Napoca, Romania	7.02.2022-27.04.2022	(QS WUR (451-500)), Times Higher Education WUR (1001-1200th 2023), Scimago Institutions Rankings (Chemistry 777)
6.	Beknazarov K.I., Tokpayev R.R.	8D07103 - Chemical Technology of Explosives and Pyrotechnics, 2 c.	Miroslava El Fry, PhD, Professor, West Pomeranian University of Technology	West Pomeranian University of Technology, Poland, Szczecin	09.02.2022-24.04.2022	651 in Scimago Institutions Rankings
7.	Kauypbai O., Malchik F.I.	8D07102 Chemical Engineering	DjenizianThierry, PhD, professor, École des Mines de Saint-Étienne	École des Mines de Saint-Étienne, Saint-Étienne, Франция		QS WUR, Times Higher Education WUR 501-600,

During the audit, the teachers explain that soft skills are trained in some courses, for example, in the course "Project Management" where the students learn skills for developing and managing research and technical projects to solve urgent problems of chemical technology and engineering, or in "Academic writing". The doctoral students express their satisfaction with the opportunities and support offered by the University for academic mobility and

international collaboration. The experts conclude that KazNU offers a wide range of opportunities for the personal and professional development of the PhD students and sufficient support and cooperation for mobility.

Criterion D 4 Supervision and Assessment

Evidence:

- Self-assessment report (SAR)
- Academic Policy
- Discussion during the audit

Preliminary assessment and analysis of the peers:

According to the SAR, the dissertation is carried out under the guidance of national and foreign scientists and are specialists in the field of the scientific research project. The dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value and academic integrity. The academic supervisors work in close collaboration with the students and provide assistance and advice in the research process.

At the end of each semester, the doctoral students have to prepare a report on their process, which has to be presented at an interim assessment of the graduating department. Furthermore, at the end of each academic year, the students need to present their progress in front of the Academic Council at the faculty at KazNU. The university has issued official guidelines and requirements for PhD students. These rules outline the requirements for graduations which include mandatory publications. At least two articles and one review have to be published. In one of the papers, the doctoral student has to be the first author or the first author for correspondence. The goal of the publication of the main scientific results of the dissertation in scientific journals is to acquaint the scientific community with the results of the research, as well as to assess the novelty in the chosen field of science.

In conclusion, the experts note that the teachers are in close contact and work together with them in their research projects and students feel well supervised and supported. Assessment rules seem to be clearly formulated and binding.

Criterion D 5 Infrastructure

Evidence:

- Self-assessment report (SAR)
- Academic Policy

- Discussion during the audit

Preliminary assessment and analysis of the peers:

Doctoral students can conduct their research projects in the faculty laboratories. Most of the research takes place in research units that have good equipment, including specialized software. In addition, they have the opportunity to apply to open-type laboratories at like the National Nanotechnology Laboratory of Open type and the Laboratory of engineering profile. According to an equipment list presented in the SAR, a large number and variety of equipment is available for the experimental work and research activities of the doctoral candidates.

Based on the tour of the institution and laboratories (see above **3.2 Fund and Equipment**), the experts observe that PhD students are provided with an adequate research environment that allows them to appropriately carry out their research projects.

Criterion D 6 Funding

Evidence:

- Self-assessment report (SAR)
- Academic Policy
- Discussion during the audit

Preliminary assessment and analysis of the peers:

As stated in the SAR, doctoral candidates at KazNU have to compete to receive grant funding for their research projects. These grants are issued by the Ministry of Science and Higher Education of the Republic of Kazakhstan. To enrol in one of the PhD programs, the students need to successfully obtain a grant funding in order to conduct their studies and research. There is also a scholarship for doctoral candidates of currently 195 thousand tenge (195.000 KZT about 400 EUR). In addition, various competitions are held annually for young scientists. Moreover, there is a competition "Zhas Galym", which is attended only by doctoral students of 3 years, as well as non-defended doctoral students.

Below is the data and number of students and young scientists involved in research on a paid basis in 2022:

No	Project name, manager	Students (full name, course, specialty, department)	Undergraduates (full name, course, specialty, department)	Doctoral students (full name, course, specialty, department)
1.	AP08052684 "Effective development of methods for	A. B. Muratuly 4		Bukenov B. O. PhD 3 -2022

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	analyzing environmental objects based on vapor-phase solid-phase microextraction using computer modeling", B. Kenesov			Kapar A. A. PhD 2-3
2.	AP08857501 "Improvement and development of highly sensitive methods for ensuring the safety of food products in Kazakhstan", S. Egemova			Ibraimov A. B. PhD 2-3
				Mamedova M. R. PhD 3 -2022
				Syrgabek E. A. PhD 2-3
3.	AR08856725 "Sodium batteries for large-sized energy storage devices in renewable energy of Kazakhstan", Boy F.I.			Kaupbay O. Sh. PhD1
				Maldybaev K. M. PhD1
4.	AP09058570 "Development of a method for electrochemical modification of a carbon sorbent to give it the required sorption properties", A. Atchabarova			Abduakhytova D. A. PhD 3 -2022
				Abdymomyn S. K. PhD1
				Beknazarov K. I. PhD 2-3
5.	AP09058606 Development of a methodology for determining weighted average concentrations of organic pollutants for monitoring the atmospheric air of Almaty, Baymatova N. H.		Tursun K. M. M1	Bukenov B. O. PhD3 2022
				Ibragimova O. P. PhD3 2022
6.	AP09058376 Production and research of activated carbons based on waste plant raw materials and their use in sorption of noble and heavy metals, Kishibaev K. K.	Kayubalieva A.M. B3-4		Ibraimov Z. T.
		Shchendrygina E.N. B3-4		Havaza T. N. PhD3 2022
7.	AP09058656 Development of scientific foundations of metal complex hydroalkoxycarbonylation of C4-C10 olefins of oil refining, Kudaibergenov N.		Mamyrkhan D.B. M2 2022	Meirbekov N. A. PhD 2-3
8.	AP09058354 Hybrid electrodes based on MXene and intercalation material for ultrafast energy storage based on aqueous electrolytes, Boy F.I.			Zhigalenok Y. S. PhD1
				Kaupbay O. Sh. PhD1
9.	AP09057951 Development of "green" methods for the determination of pesticides in environmental objects based on vacuum solid-phase microextraction, Orazbayeva D. S.			Bektasov M. A. PhD1
				Zhumadildinova A. B., 1 K.

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10.	AP09058322 Synthesis and research of a composite based on an organometallic compound (MOF) for its use as an anode material in sodium-ion batteries, Trusov I. A.		Starodubtseva A.S. Mag.1	
11.	AP09260383 Development of a reversible anode for magnesium-ion batteries, Argimbayeva A.M.			Zhumanova R. Zh. PhD3 2022
12.	AP09260359 Comprehensive assessment of air pollution in Almaty: identification of sources, spatio-temporal analysis, Baymatova N. X.			Tursumbayeva M. O. PhD2-3
		Seidalieva A.R. B1		
13.	AP09260371 Establishing the mechanism of influence of modifying coatings of the active material of sodium-ion battery cathodes on the kinetics of intercalation, Boy F.I.			Maldybayev K. M. PhD1
			Ryabicheva M.A. M4-2022	
14.	"BR10965258 Development of a research program to improve air quality in the cities of Nur-Sultan and Almaty using modern analytical methods and modeling tools", Baymatova N. H.	Serik L.A. B3-4		Bektasov M. A. PhD1
		Sovetova D.O. B3-4		Tursumbayeva M. O. PhD2-3
		Sisenbai M.O. B3-4		
		Zhalyaletdinova A.N. B3		
		Musienko S.V. B3		
15.	AR14871991 "Development of energy-intensive anode materials based on conductive metal-organic compounds (MOF) for metal-ion batteries", Galeeva A.K.	MAlik S.		Maldybayev K. M. PhD1
16.	AP14871374 "Development of precise methods for gas chromatographic determination of volatile organic compounds in environmental objects at the sampling site using solid-phase microextraction", Kenesov B.N.			Kurmanbaeva T. S. PhD1
17.	AR14871970 "Development of an innovative aqueous electrolyte for high-energy metal-ion batteries", Kurbatov A.P.			Abdymomyn S. K. PhD1
18.	AR14871554 "Optimization of an innovative method for synthesis of aluminized titanium carbide as the main material for obtaining 2D Mxene materials (Ti ₃ C ₂ , Ti ₂ C)". Boy F.I.		Sarsenbai Kali Y.	

In conclusion, the expert group finds that the university and the state grants provide enough financial support for doctoral candidates and that the doctoral programme under review has adequate and sustainable funding.

Criterion D 7 Quality Assurance

Evidence:

- Self-assessment report (SAR)
- Academic Policy
- Discussion during the audit

Preliminary assessment and analysis of the peers:

According to the SAR, the policy and documented procedures have an official status and are publicly available in <https://portal.kaznu.kz>. In the Univer system, a variety of statistical data of students and graduates is available for collection and analysis: the number, their affiliation to various educational programs, personal data, academic performance in the context of both one semester and for the entire period of study.

The university has also approved an “Academic Integrity Policy” on 29th September 2002 where all basic concepts and principles as well as types of violations (e.g. plagiarism, cheating, duplication, falsification etc.) of academic integrity and disciplinary actions in these cases are described. In addition, rules concerning research activities are consigned in this document. There is stipulated that research shall be carried out on the basis of the principles of academic integrity and are based on “The Code of Ethics for Scientists.”

During the audit, the experts can confirm that the regulations are published in the university website and available for all stakeholders and that the university follows rules of good scientific practice, for example, controlling plagiarism and unethical behaviour. In addition, rules and relevant information can be also be found in the Univer system and is accessible for each enrolled student and for the staff.

E Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

- Table with following information: which didactic method is used in which module / which exam type is offered in which module / which synthetic method or reaction mechanism is taught in which module or experiment in the lab modules.

F Comment of the Higher Education Institution (28.05.2023)

The institution provided a detailed statement as well as the following additional documents:

- Appendix 1: Example of learning outcomes for modules in Bachelor in Chemistry
- Appendix 2: List of didactic methods, examinations per module

The following quotes the comment of the institution:

“Criterion 1.1 Objectives and learning outcomes of a degree program (intended qualifications profile)

1. Comment. According to the university website, graduates of the **Chemistry bachelor's degree program** are capable to work in several professions, for example, as researchers at manufacturing companies, research institutions or scientific organizations; as teacher in higher educational institutions or colleges or in schools; as senior position in the field of education. With respect to the job market perspectives, KazNU gifts an overview about the employment of graduates. During the last five years (2018-2022), for the **Bachelor in Chemistry** a total of 91% of the graduates are employed, for **MA Chemistry** and **MA Chemistry (ed .)** 100%, and for the **Bachelor in Pharmaceutical Manufacturing Technology** in the last year (2021-2022) 83%. *However, there is no information either about the areas of employment, neither about employers.*

Response

In fact, detailed information about the areas of employment and employers is available on the website of the faculty:

- <https://www.kaznu.kz/en/25055/page/> for Bachelor in PMT;
- <https://www.kaznu.kz/en/25049/page/> for Bachelor in Chemistry;
- <https://www.kaznu.kz/en/26259/page/> for MA Chemistry (ed.);
- <https://www.kaznu.kz/en/26172/page/> for MA Chemistry;
- <https://www.kaznu.kz/en/25163/page/> for PhD Chemical engineering.

2. *Comment.* After reviewing the learning outcomes and discussing them with the various stakeholders, the experts conclude that the descriptions of the qualification objectives are comprehensive and include the competencies achieved and the possible career opportunities for graduates. The objectives and learning outcomes are made available to all stakeholders as they can be found on the KazNU website. In addition, they are anchored and published in a transparent manner, making them available to students, lecturers and interested third parties. On the basis of a Learning Objectives-Module Matrix presented at the beginning of each module handbook, which describes the modules in which students learn the skills envisaged in the PLOs, the expert group considers that the intended learning outcomes of the programs are suitable for producing qualified graduates. However, they are of the opinion that learning outcomes could be more specific and clear described in the module descriptions. *The auditors recommend to provide the module descriptions by better learning outcomes for the future.*

Response

This wish will be taken into account. Additions will be made to the modules description catalogs. Each module descriptions will be provided by specific and clear learning outcomes (example presented in Appendix 1).

Criterion 1.3 Curriculum

1. *Comment.* Moreover, the participant industry partners stress that students are very motivated and interested in future technologies. Students have good fundamentals and theoretical knowledge. Nevertheless, the experts learn from the industry partners that practical skills like laboratory work should be improved. In the area of pharmaceutical manufacturing, they noted that students are not familiar with registration of drugs and GMP. *They recommend the university to introduce more content in this area in the curricula. Regarding soft-skills, they believe that this aspect was already improved and they are making progress.*

Response

In fact, in the **Pharmaceutical Manufacturing Technology** program students **study all** the regulatory requirements of appropriate GXP practices (GMP, GPP, GLP, GDP, GVP), which are applied to the production of medicines and medical devices; learn the rules of compiling pharmaceutical drug development, analytical regulatory documents (ARD) and technological instructions for their production; learn the requirements for the development and preparation of validation reports on the production technology of drugs and medical devices, determination of stability, as well as a full list of documents required for their state registration. We will conduct an additional survey among students and employers, based on the results of which, if necessary, the content of the relevant disciplines will be adjusted.

2. *Comment.* Nevertheless, regarding the **Master's degree Program Chemistry (7M05301)** experts recommend to introduce more laboratory work hours. Although bachelor students have, according to program coordinators and teachers, enough laboratory work during the bachelor's degree, the expert group considers, based on the industry partner's opinion, very important to increase the practical work in the Master's program.

Response

Although laboratory classes are not provided in **Master's degree Program Chemistry (7M05301)**, undergraduates acquire practical skills in the course of research practice (9 credits), completion of research and master's thesis (24 credits). In addition, during the internship, undergraduates get the opportunity to master new modern research methods in the universities abroad, as well as in domestic advanced research centers.

3. *Comment.* Regarding the **Master's program Chemistry (ped .)**, the experts think that the teaching internship is a good method to prepare the students for their future profession as teachers. However, they recommend to introduce more practice and presentations in the courses of the Master's program Chemistry (ped .), in order to develop the student's teaching skills. *It could be considered if the teaching practice could be introduced not in the second semester, but later, when students are better prepared to undertake this task.*

Response

The suggestion for improvement has already been taken into account. For the admission of 2023, the curricula for 7M01503 – Chemistry program has been revised. Teaching practice has been moved from 2nd - to 3rd semester.

More details at <https://cloud.mail.ru/public/nvnw/msnhh513A>

4. *Comment.* In addition, regarding the **Bachelor's program Pharmaceutical Manufacturing Technology**, the experts recommend to increase the synergy between the pharmacy program offered by the faculty of Medicine of KazNU and the program under review of the faculty of Chemistry.

Response

According to the classification of educational programs of Kazakhstan, "6B10102 - Pharmacy" of the Medical Faculty of KazNU (training area - 6B101 Health Care; term of study - 5 years) and "6B07201 - Pharmaceutical Manufacturing Technology" of the Faculty of Chemistry and Chemical Technology (training area - 6B072 Manufacturing and Processing Industries, term of study - 4 years) belong to different groups of educational programs.

Within the existing limitations, due to the fact that these educational programs have different learning objectives, the interaction between the faculties still exists.

To create high-quality and safe medicines, the Bachelor's program Pharmaceutical Manufacturing Technology includes: "Fundamentals of Pharmacology" (classes with students are conducted by lecturers from the Department of Pharmacology of Kazakh National Medical University); classes on "Physiology and basics of anatomy", "Screening and preclinical studies of pharmaceuticals", "Microbiology and virology" are conducted by lecturers of the Faculty of Biology and Biotechnology of KazNU.

Lecturers of the PMT program take part in teaching chemical disciplines to students of the "Pharmacy" program.

However, we take into account the wishes and will try to find additional interactions as part of the preparation of students in areas.

Criterion 1.4 Admission requirements

1. *Comment.* The admission requirements are, according to the university, published on the university website. However, some links provided by the university regarding admission to Master's degree (<https://www.kaznu.kz/en/26811/page/>) and admission to doctoral studies : (<https://www.kaznu.kz/en/26811/page/>) could not be found on the website, though the link is active.

Response

At the moment, the university is working on the transition of the site to a new platform. On certain days, interruptions were possible, including some pages might not open. During the summer, a new website of the university will be launched. Nevertheless, we provide currently working links to the pages of the faculty website, where you can find up-to-date information about the admission requirements:

Bachelor in PMT Bachelor in Chemistry	https://www.kaznu.kz/ru/26808/page/
MA Chemistry (ed.) MA Chemistry	https://www.kaznu.kz/en/26810/page/
PhD Chemical Engineering	https://www.kaznu.kz/en/26811/page/

Criterion 1.6 Didactic and Teaching Methodology

1. *Comment.* The experts appreciate the diversity of teaching methods and believe that they ensure that the course objectives and the overall intended learning outcomes are achieved.

Nevertheless, the experts stress that the provided documents are no matrices. The University should provide a table, which didactic method is used in which module / which exam type is offered in which module / which synthetic method or reaction mechanism is taught in which module or experiment in the lab modules. This will provide a very quick and comprehensive view on the teaching methods, exams and practical methods and will help them to improve their teaching portfolio.

Response

Table with didactic forms is given in Appendix 2.

Criterion 2 Exams: System, concept and organization

1. Comment. The experts take note that the Exam Rules correspond to the year 2022-2023 and wonder whether these regulations change each year considering that one month period of publishing before the exams would be very short. In addition, they are missing examination rules for each program.

Response

Examination rules are revised and published every academic year before exams. The rules are specific only for different types of exams, but not the educational programs. Therefore, Examination rules are unified for all educational programs at the university.

In order to effectively organize the examination session for each discipline, an exam program is developed. It is prepared based on a general program (examination rule) in accordance with the type and form of the exam and depending on the platform on which the exam is conducted. These programs are considered by the methodological council and approved by the head of the department. Further, the program is placed in the UNIVER system in open access for students.

2. Comment. The auditors review the exam and thesis samples provided by the HEI. According to them, the documents prove that the level of the students' academic performance and the modules contents is sufficient for the respective program. Furthermore, they are of the opinion that the number and distribution of exams ensure an adequate workload as well as sufficient time for preparation. However, the experts are of the opinion that especially the Master's program Chemistry (ped.) due to the focus in the area of pedagogic should integrate more oral examination types such as presentations and simulations of teaching situations.

Response

Following the didactic table above there are 10 written exams and 9 oral types of exams (case studies, reports, projects). In the future, according to the suggestion of the experts the share of oral exams will be increased.

3. Resources

Criterion 3.2 Funds and equipment

Comment. Regarding the teaching laboratories, the experts conclude that the basic equipment is good and adequate to train students and enable them to achieve the ILOs of their respective degree programs. However, they think that specialized equipment could be improved eg more equipment for basic process engineering operations like distillation, extraction, mechanical separation techniques; NMR-Spectrometer (benchtop); magnetic stirrers, automatic titrators, automatic vacuum controller. Furthermore, during the tour of the laboratories, they note that the safety conditions have to be increased according to international standards. For instance, safety glasses were not worn neither by teacher nor by students. In addition, the language of the descriptions and indications and the labeling of the stored chemicals has to be in different languages and the chemicals should be labeled with the international hazard symbols. Fire extinguishers have to be fixed to the walls not be left standing on the floor and gas cylinders should be attached to avoid accidents. The labs in which dangerous chemicals are handled (organic and inorganic chemistry) could be equipped with more fume hoods.

Response

The Faculty of Chemistry and Chemical Technology updates the material and technical base according to annual plan of teaching and research equipment purchase. For example, this year we are planning to buy a scanning electron microscope for educational and research purposes.

Safety conditions will be improved according to the international standards. Regarding the safety glasses not worn by students and teacher, they wear safety glasses and gloves during the experiments. When there was a tour of the laboratories, students were writing the control work, so there were no need for safety glasses. However, when conducting any practical classes students and teachers wear all necessary safety outfit.

We agree with the recommendation of translating the descriptions and indications, since there are foreigners studying in the Faculty .

Fire extinguishers will be fixed to the walls and gas cylinders will be attached at the earliest.

All international standards on safety conditions will be fulfilled before 2023-2024 academic year.

4. Transparency and documentation

Criterion 4.1 Module descriptions

Comment. However, the auditors observe that the complete detailed module handbooks for the respective programs do not appear to be publicly available on the University/Faculty's website and recommend to introduce this information at the university website. In this way, all the stakeholders and interested candidates can access to this information.

Response

Detailed module descriptions (name of the module, aim of the module, assessment policy, etc.) are available in the Univer system, as well as on the University website through the links (module descriptions are in the pop-up window):

- https://welcome.kaznu.kz/en/education_programs/bachelor/speciality/1417 for Bachelor in PMT;
- https://welcome.kaznu.kz/en/education_programs/bachelor/speciality/1403 for Bachelor in Chemistry;
- https://welcome.kaznu.kz/en/education_programs/magistracy/speciality/1416 for MA Chemistry (ed.);
- https://welcome.kaznu.kz/en/education_programs/magistracy/speciality/1404 for MA Chemistry;
- https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1422 for PhD Chemical engineering.

5. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Comment. Nevertheless, the auditors conclude that the students have to be included more actively into the feedback loops of the university quality management system and after the teaching evaluation, the teacher of each evaluated course should discuss the results with the students.

Response

The suggestion is accepted. At the moment, a new system of comprehensive assessment of the teacher and educational programs is being developed, and student surveys on satisfaction with educational programs will be conducted more frequently. Teachers will be encouraged to introduce mandatory discussion of the course with students. This practice will be recommended.”

G Summary: Peer recommendations (31.05.2023)

Taking into account the additional information and the comments given by the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	30.09.2029
Ma Chemistry	With requirements for one year	30.09.2029
Ma Chemistry (ped)	With requirements for one year	30.09.2029
Ba Pharmaceutical Manufacturing Technology	With requirements for one year	30.09.2028
PhD Chemical Engineering	With requirements for one year	30.09.2028

Requirements

For all degree programmes

- A 1. (ASIIN 3.2) International standards of safety conditions in the laboratories must be met.
- A 2. (ASIIN 5) Teachers need to discuss with their students about the results of the questionnaires and what improvements might be possible, the feedback cycles need to be closed.

Recommendations

For all degree programmes

- E 1. (ASIIN 3.2) It is recommended to improve special equipment in the laboratories.
- E 2. (ASIIN 4.3) It is recommended to include the complete detailed module handbooks for the respective programs in the Faculty's website.
- E 3. (ASIIN 5) It is recommended to increase the participation and cooperation with students, e.g. within the framework of the academic boards.

For the Bachelor' degree programme Pharmaceutical Manufacturing Technology

- E 4. (ASIIN 1.1.) It is recommended to intensify the synergy between the Pharmacy degree programme offered by the Faculty of Medicine and the Bachelor' degree programme Pharmaceutical Manufacturing Technology.
- E 5. (ASIIN 1.3) It is recommended to introduce in the curriculum more contents in the area of registration of drugs and GMP.

For the Master's Degree Programme Chemistry

- E 6. (ASIIN 1.3., 1.6) It is recommended more intensively to train student's practical skills and to introduce more laboratory hours.

For the Master's Degree Programme Chemistry (Ped.)

- E 7. (ASIIN 1.3., 1.6) It is recommended to introduce more oral examination forms as well as practice and presentations in the courses of the Master's program Chemistry (ped.), in order to develop the student's teaching and soft skills.

H Comment of the Technical Committees (05.06.2023)

Technical Committee 09 – Chemistry, Pharmacy (02.06.2023)

Assessment and analysis for the award of the ASIIN seal:

The TC follows the positive assessment of the expert group and supports the issuance of two requirements, one regarding the safety standards in the laboratories and one regarding the lack of feedback of the results of the teaching evaluations to the students.

The Technical Committee 09 – Chemistry, Pharmacy recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	30.09.2029
Ma Chemistry	With requirements for one year	30.09.2029
Ma Chemistry (ped)	With requirements for one year	30.09.2029
Ba Pharmaceutical Manufacturing Technology	With requirements for one year	30.09.2028
PhD Chemical Engineering	With requirements for one year	30.09.2028

Technical Committee 01 – Mechanical Engineering/Process Engineering (05.06.2023)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and follows the assessment of the peers without any changes.

The Technical Committee 01 – Mechanical Engineering/Process Engineering recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	30.09.2029
Ma Chemistry	With requirements for one year	30.09.2029
Ma Chemistry (ped)	With requirements for one year	30.09.2029
Ba Pharmaceutical Manufacturing Technology	With requirements for one year	30.09.2028
PhD Chemical Engineering	With requirements for one year	30.09.2028

I Decision of the Accreditation Commission (22.06.2023)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discusses the procedure. Regarding requirement A2, the AC prefers to use "Teaching staff" instead of "Teachers". Otherwise, the AC follows the assessment of the peers and the TC without any changes.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	30.09.2029
Ma Chemistry	With requirements for one year	30.09.2029
Ma Chemistry (ped)	With requirements for one year	30.09.2029
Ba Pharmaceutical Manufacturing Technology	With requirements for one year	30.09.2028
PhD Chemical Engineering	With requirements for one year	30.09.2028

Requirements and recommendations for the applied labels

Requirements

For all degree programmes

- A 1. (ASIIN 3.2) International standards of safety conditions in the laboratories must be met.
- A 2. (ASIIN 5) Teaching staff need to discuss with their students about the results of the questionnaires and what improvements might be possible, the feedback cycles need to be closed.

Recommendations

For all degree programmes

- E 1. (ASIIN 3.2) It is recommended to improve special equipment in the laboratories.
- E 2. (ASIIN 4.3) It is recommended to include the complete detailed module handbooks for the respective programs in the Faculty's website.
- E 3. (ASIIN 5) It is recommended to increase the participation and cooperation with students, e.g. within the framework of the academic boards.

For the Bachelor' degree programme Pharmaceutical Manufacturing Technology

- E 4. (ASIIN 1.1.) It is recommended to intensify the synergy between the Pharmacy degree programme offered by the Faculty of Medicine and the Bachelor' degree programme Pharmaceutical Manufacturing Technology.
- E 5. (ASIIN 1.3) It is recommended to introduce in the curriculum more contents in the area of registration of drugs and GMP.

For the Master's Degree Programme Chemistry

- E 6. (ASIIN 1.3., 1.6) It is recommended more intensively to train student's practical skills and to introduce more laboratory hours.

For the Master's Degree Programme Chemistry (Ped.)

- E 7. (ASIIN 1.3., 1.6) It is recommended to introduce more oral examination forms as well as practice and presentations in the courses of the Master's program Chemistry (ped.), in order to develop the student's teaching and soft skills.

Appendix: Programme Learning Outcomes and Curricula

According to the SAR the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the programmes under review:

Chemistry (BA)

“ON1. formulate modern ideas about the main directions of development of chemistry as a science, the basic principles, laws and theories of its fundamental sections;

ON2. classify physical and physico-chemical methods for studying the properties of substances and processes; methods to synthesize and obtain chemicals and materials;

ON3. demonstrate an understanding of the dependence of substance reactivity on structure of the molecules, the nature of the chemical bond, the composition of the system and conditions of the chemical reaction; of regularities of physical and chemical processes based on modern achievements of theoretical and applied chemistry;

ON4. solve standard tasks of professional activity using the knowledge of the bases of theoretical and applied chemistry and fundamental concepts of other natural, social sciences and humanities courses;

ON5. substantiate the use of synthetic and analytical methods for study the properties of substances, parameters and regularities of physico-chemical processes;

ON6. calculate and estimate the basic thermodynamic, kinetic parameters of various physico-chemical systems and processes, including the application of the modern computing technology;

ON7. predict the possibility, direction and depth of chemical processes in order to obtain the product with a desired characteristics and to increase its output based on the calculated and experimental data on the properties of substances and process parameters;

ON8. analyze the reasons for deviations of process parameters, including technological, in order to make decisions on their prevention and correction;

ON9. plan, organize and conduct a scientific experiment or test involving physical, chemical and mathematical methods, followed by processing the obtained results;

ON10. substantiate the choice of a mathematical model, the most efficient method for synthesis, analysis and measuring instruments to solve specific research or production task;

ON11. conduct a critical analysis and systematization of the results of a study or test with the subsequent presentation of materials in the form of scientific reports, publications, presentations;

ON12. evaluate the state of systems and processes in order to improve, develop and implement methods, approaches, technologies and measures aimed at reduction of environmental pollution, improving the rational use of natural resources, safety and environmental friendliness of products and technologies;

ON13. apply in professional and social life for successful personal growth the scientific and philosophical heritage of al-Farabi and Abay, administrative and legal norms in the field of combating corruption, patterns of interaction between living organisms and the environment.”

Chemistry (MA)

“ON1. interpret scientific theories and concepts in the relevant specialized field of fundamental and applied chemistry;

ON2. integrate the latest achievements of science and practice in the field of chemistry into the practical activities of a research chemist, a teacher chemist to solve professional tasks, including in a wider interdisciplinary context, focused on achieving environmental, social, economic and other goals;

ON3. conduct a systematic search and prepare a scientific review of the state of modern scientific research on a specific topic;

ON4. carry out the analysis of scientific information for the formulation of scientific hypotheses in the framework of his/her own research;

ON5. independently formulate the goal and objectives of scientific research, as well as the expected result, based on a critical analysis and evaluation of modern scientific concepts, achievements and research in the studied profile/field of chemistry;

ON6. make a reasonable choice of methods, techniques, computer programs and applications of mathematical modelling and calculation, to control the process, including technological, performing a scientific experiment, processing and generalizing the results obtained;

ON7. analyze and interpret the obtained data (process control, scientific research results) to substantiate their reliability and value in the framework of modern concepts and theories in the field of chemistry;

ON8. apply fundamental and modern knowledge and methodology of physico-chemical research to develop new and improve existing methods for production of substances and materials with specified characteristics, methods of study of substances, materials and processes, technological processes or their stages;

ON9. carry out qualitative and quantitative modelling of a process in order to establish its mechanism, ways of its regulation, to obtain a product with specified characteristics or to increase its output, to determine the optimal conditions for its implementation and control;

ON10. develop a curriculum for teaching chemical disciplines in the context of modern achievements in the field of chemistry and requirements of the higher education pedagogy;

ON11. present the results of his/her own research in the chosen field of chemistry in the form of a scientific publication;

ON12. continue independent and autonomous training for creative self-development and self-improvement, for development of basic and subject-matter competencies along professional activity.”

Chemistry (MA, ped)

“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 such in a foreign language;

ON3. carry out the selection, structuring and implementation of educational material in chemical sciences in accordance with the goals and objectives of chemical education, considering 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 implementation 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 for solving the tasks;

ON11. carry out scientific experiments in the field of chemistry and adequately interpret obtained results;

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

Pharmaceutical Manufacturing Technology (BA)

“ON1. possess theoretical knowledge and practical skills for development of technology for manufacturing of drugs and medical devices;

ON2. define various dosage forms of drugs, organize the technology of their production, as well as control the quality of substances and excipients in accordance with the requirements of Good Pharmacy and Manufacturing Practices (GPP, GMP) and State Pharmacopoeia of the Republic of Kazakhstan (SP RK);

ON3. manage drugs manufacturing in the form of substances, excipients and preparations in pharmacy conditions, pilot industrial and industrial series, determine the stability of drugs in the selected storage mode and packaging, conditions for their transportation and sale in accordance with the current legislation of the Republic of Kazakhstan in the field of healthcare, GPP, GMP and Good Distribution Practice (GDP);

ON4. carry out the calculation and selection of equipment, production lines, installations, calculations of the optimal quantities of loaded components for the formation of pilot industrial and industrial series, considering the minimum and maximum working volumes of technological equipment, step-by-step and final validation control of manufacturing of drugs and medical devices;

ON5. determine, in accordance with the international standards and internal documents of the quality and management system, the quality indicators of drugs, their substances, excipients, medical devices and develop regulatory documents for them in accordance with the requirements of SP RK and GMP;

ON6. qualify hardware equipment, validate production technologies for drugs and medical devices, analytical methods for controlling their quality, develop and compile validation reports;

ON7. identify the active and auxiliary components of drugs using modern physico-chemical methods, construct medical devices for providing input and output control of technological processes for manufacturing of drugs and medical devices;

ON8. apply advanced innovations in the production technology of drugs and medical devices, while monitoring their quality and standardization indicators, assessing the compatibility and ratio of substances and excipients in medicinal preparations;

ON9. work out pharmaceutical development and regulatory documentation for drugs and medical devices in the form of technological instructions for their production, interim analytical normative documentation, packaging and labelling projects, reports on their stability to confirm the shelf life and storage, validation, medical use, implementation and transportation instructions in accordance with the requirements of GMP and SP RK;

ON10. apply normative legal acts and standards to produce effective and safe medicines for the human body, their state registration, implementation and pharmaceutical supervision;

ON11. search, select and analyze information obtained from various sources for optimal fulfilment, in accordance with the requirements of the State regulations, of professional tasks related to production, quality control, packaging, storage, transportation and sale of drugs and medical devices;

ON12. inform the audience with professional and unprofessional training on procedures related to safety, pharmacological efficiency, storage and sale of medicines in accordance with the requirements of Good Pharmacy, Production, Distribution, Pharmacovigilance Practices (GPP, GMP, GDP, GVP) and SP RK.”

Chemical engineering (PhD)

“ON1. systematize scientific theories and concepts latest trends in chemical engineering for studies and presentation of research results in the press, at international conferences, in the bids form, as well as the scientific-technical projects implementation;

ON2. use modern and innovative experimental research methods for conducting fundamental and applied research at a high level and allowing to obtain results that meet international requirements;

ON3. generate new scientific ideas based on modern scientific and technical information in specialized fields of chemical engineering using international databases;

ON4. critically evaluate various scientific and technological theories, concepts and approaches for solving research, practical, analytical and managerial tasks in the current chemical technology areas;

ON5. predict chemical, including environmental, systems behaviour based on the analysis of modern theoretical approaches and achievements in various chemical engineering fields;

ON6. carry out teaching activities in higher education organizations, including training programs development for the new knowledge introduction and research results in educational programs in the chemical engineering field;

ON7. carry out planning and research and technological works organization to solve modern chemical engineering problems in the processing field of natural and man-made raw materials, petrochemical, biochemical, electrochemical, environmental technologies;

ON8. develop design documentation, regulatory documents to support the production and materials processing;

ON9. create new cost-effective and environmentally friendly methods and technologies for the production and substances and materials processing;

ON10. develop projects for the creation and new knowledge practical application, research methods and technologies in relevant modern chemical engineering areas;

ON11. manage production, services and enterprises in the industrial safety context, quality management, risk prevention, sustainability and environmental protection;

ON12. maintain cooperation and interaction with national and foreign research and production groups in the chemical engineering field and related industries.”

PhD Chemical Engineering

“ON1. Systematize the scientific theories and concepts of the latest directions in chemical engineering.

ON2. Analyze modern scientific and technical information in leading scientific journals in the specialized field of chemical engineering using international databases.

ON3. Propose new hypotheses for solving actual problems of the chosen area of chemical engineering.

ON4. Apply systemic and interdisciplinary knowledge for the development of the scientific and technical base of the specialized area of chemical engineering.

ON5. Perform teaching activities in the field of research-based areas of chemical engineering in higher education organizations.

ON6. Develop curricula for introducing new knowledge and research results into educational programs in the field of chemical engineering.

ON7. Perform planning and organization of research work to solve modern problems of chemical engineering.

ON8. Develop design documentation, regulatory documents related to the production and processing of materials.

ON9. Manage production, services and enterprises in the context of industrial safety, quality management, risk prevention, sustainability and environmental protection.

ON10. Develop new cost-effective and environmentally friendly technologies for the production and processing of substances and materials.

ON11. Develop projects for the creation and practical application of new knowledge in current areas of modern chemical engineering.

ON12. Support cooperation and interaction with state and foreign research groups in the field of chemical engineering and related industries.”

The following **curriculum** is presented for the programmes under review:

Chemistry (BA)

GENERAL EDUCATION DISCIPLINES (Общеобразовательные дисциплины)		CORE DISCIPLINES (Базовые дисциплины)		MAJOR DISCIPLINES (Профильные дисциплины)	
OBLIGATORY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
51	5	94	18	36	24
56		112		60	

1	Module of social and cultural development & Instrumental module & Module Physical Training 25 ECTS		General chemistry and mathematics 6 ECTS		31
2	Module of social and cultural development & Instrumental module & Module Physical Training 12 ECTS	Elective component (1 of 6) 5 ECTS	General chemistry and mathematics 12 ECTS		29
3	Instrumental module & Module Physical Training 7 ECTS		Physics and Physical chemistry Inorganic and organic chemistry Analytical chemistry 24 ECTS		31
4	Module of social and cultural development & Module Physical Training 7 ECTS		Physics and Physical chemistry Inorganic and organic chemistry Analytical chemistry 22 ECTS		29
5	Structure of matter and physical research methods 6 ECTS	Physico-chemical systems and its modelling 6 ECTS	Basis of Chemical Technology 18 ECTS		30

0 Appendix: Programme Learning Outcomes and Curricula

6	Structure of matter and physical research methods 6 ECTS	Physico-chemical systems and its modelling 12 ECTS	Basis of Chemical Technology 12 ECTS	30
7	Metrology and standardization in chemistry 6 ECTS	Chemical physics 6 ECTS	Chemical Expertise 24 ECTS	36
8	Metrology and standardization in chemistry 9 ECTS	Chemical physics 3 ECTS	FINAL ATTESTATION 12 ECTS	24

Chemistry (MA)

RESEARCH		CORE DISCIPLINES (Базовые дисциплины)		MAJOR DISCIPLINES (Профильные дисциплины)	
UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
		20	15	19	30
24		35		49	

1	<p>M-1 Module on history and philosophy of science 3 ECTS</p> <p>M-2 Psychology and Pedagogy Module 8 ECTS</p> <p>Total 11 ECTS</p>	<p>M-3 Selected chapters of the main directions of chemistry 15 ECTS</p>		<p>M-4 Organization of research in the field of modern chemistry 5 ECTS</p>	<p>RES.</p> <p>Master's Student Research (MSR), Including Scientific Internship And Dissertation Writing 2 ECTS</p>	<p>33 ECTS for the 1st Term</p>
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2	<p>M-1 Module on history and philosophy of science 5 ECTS</p> <p>M-2 Psychology and Pedagogy Module 4 ECTS</p> <p>Total 9 ECTS</p>	<p>M-4 Organization of research in the field of modern chemistry 5 ECTS</p>	<p>M-4 Organization of research in the field of modern chemistry</p> <p>10 ECTS</p>	<p>RES. Master's Student Research (MSR), Including Scientific Internship And Dissertation Writing 3 ECTS</p>	<p>27 ECTS for the 2nd Term</p>
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3	<p>M-4 Organization of research in the field of modern chemistry 9 ECTS</p>	<p>M-4 Organization of research in the field of modern chemistry 20 ECTS</p>		<p>Master's Student Research (MSR), Including Scientific Internship And Dissertation Writing 1 ECTS</p>	<p>30 ECTS for the 3rd Term</p>
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0 Appendix: Programme Learning Outcomes and Curricula

4	RESEARCH Master's Student Research (MSR), Including Scientifing Internship And Dissertation Writing 18 ECTS		FINAL ATTESTATION 12 ECTS	30 ECTS for the 4 th Term
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Chemistry (MA, ped)

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	
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	30

0 Appendix: Programme Learning Outcomes and Curricula

				Dissertation 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		Master's Student Research (MSR), Including Scientific Internship And Dissertation Writing 2	33
4	RESEARCH Master's Student Research (MSR), Including Scientific Internship And Dissertation Writing 15 ECTS	FINAL ATTESTATION 12 ECTS			27

Ba Pharmaceutical Manufacturing Technology

GENERAL EDUCATION DISCIPLINES		CORE DISCIPLINES		MAJOR DISCIPLINES	
OBLIGATORY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
51	5	87	25	40	20
56		112		60	

1	<i>Module of social and cultural development</i> 5 ECTS	<i>Instrumental module</i> 5 ECTS	<i>Module of Physical Training</i> 2 ECTS	<i>Physics and mathematics module</i> 10 ECTS	<i>Module of General Engineering Disciplines</i> 5 ECTS	<i>Module of inorganic substances and their identification</i> 5 ECTS	32
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2	<i>Instrumental module</i> 5 ECTS	<i>Module of Physical Training</i> 2 ECTS	<i>Physics and mathematics module</i> 3 ECTS	<i>Module of General Engineering Disciplines</i> 5 ECTS	<i>Module of inorganic substances and their identification</i> 7 ECTS	<i>Module of organic substances and biomolecules</i> 6 ECTS	28
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3	<i>Module of socio-political knowledge</i> 8 ECTS	<i>Instrumental module</i> 10 ECTS	<i>Module of Physical Training</i> 2 ECTS	<i>Module of organic substances and biomolecules</i> 9 ECTS			29
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0 Appendix: Programme Learning Outcomes and Curricula

4	<i>Module of social and cultural development</i> 5 ECTS	<i>Instrumental module</i> 5 ECTS	<i>Module of Physical Training</i> 2 ECTS	<i>Module of pharmaceutical manufacturing compliance with international standards</i> 8 ECTS	<i>Module of physicochemistry for dispersed and polymer systems</i> \ <i>Module of mechanisms of pharmaceutical processes</i> 5 ECTS	<i>Module of medicinal plant substances</i> \ <i>Module of plant polyphenols and their effects on the body</i> 5 ECTS	<i>Module for the production of synthetic substances and their bioavailability</i> 6 ECTS	31
5	<i>Module of pharmaceutical manufacturing compliance with international standards</i> 10 ECTS		<i>Module of production technology of pharmaceutical preparations</i> 5 ECTS	<i>Module of physicochemistry for dispersed and polymer systems</i> \ <i>Module of mechanisms of pharmaceutical processes</i> 10 ECTS		<i>Module for the production of synthetic substances and their bioavailability</i> 5 ECTS		30
6	<i>Elective component</i> 5 ECTS	<i>Module of production technology of pharmaceutical preparations</i> 14 ECTS		<i>Module of medicinal plant substances</i> \ <i>Module of plant polyphenols and their effects on the body</i> 5 ECTS	<i>Module of dosage forms and medical products</i> 6 ECTS			30
7	<i>Module of medicinal plant substances</i> \ <i>Module of plant polyphenols and their effects on the body</i> 5 ECTS	<i>Module of dosage forms and medical products</i> 6 ECTS	<i>Module of state control of pharmaceutical products</i> 5 ECTS	<i>Module of technology for production of substances and drugs / Pharmaceutical analysis module/ Module of technology for finished drugs / Module of safety and efficacy of drugs</i> 20 ECTS			36	
8	<i>Module of dosage forms and medical products</i> 8 ECTS	<i>Module of state control of pharmaceutical products</i> 8 ECTS		FINAL ATTESTATION 12 ECTS			24	

Phd Chemical Engineering

RESEARCH			CORE DISCIPLINES		MAJOR DISCIPLINES	
UNIV. COMP.	RESEARCH SEMINAR	DOCTORAL THESIS	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
49	21	53	15	5	15	10
123			20		25	

1	Scientific-Research tools 5 ECTS	Elective component (1 of 2) 5 ECTS		Module of project management in research work 5 ECTS	Elective component (1 of 2) 10 ECTS	Res. Sem. 3 ECTS	Doc. Thes. 2 ECTS	30
2	Scientific-Research tools 10 ECTS		RS 3	Doctoral Thesis 11 ECTS		Graduate Seminar 6 ECTS		30
3	Module of project management in research work 5 ECTS	Research Seminar 5 ECTS		Doctoral Thesis 15 ECTS		Sci. Conf. 5 ECTS		30
4	Module of project management in research work 5 ECTS	Research Seminar 4 ECTS		Doctoral Thesis 15 ECTS		Graduate Seminar 6 ECTS		30
5	Res. Sem. 5 ECTS	Doctoral Thesis 8 ECTS		Graduate Seminar Scientific conferences (Participation) Scientific Internship 17 ECTS				30
6	RS 1	DT 2		Publication of the main scientific results of the dissertation in scientific journals 15 ECTS		FINAL ATTESTATION 12 ECTS		30