

REVIEWED Chairman of the Coordinating Council of the Educational-Methodical Association of Osh State University, Associate Professor R. N. Arapbaev _____ " _____ " _____ 2025	APPROVED Rector of Osh State University, Professor K. G. Kozhobekov _____ " _____ " _____ 2025
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OSH STATE UNIVERSITY

HIGHER PROFESSIONAL EDUCATION STANDARD

FIELD: 520100 CHEMISTRY

QUALIFICATION: BACHELOR

Osh – 2025

The Higher Professional Education Standard for the 520100 Chemistry program was discussed at the meeting of the Sectoral Committee on “_____ educational programs” of the Educational-Methodical Association of Osh State University on “_____” _____, 2025, protocol No. _____.

It was approved by the decision No. _____ of the Coordinating Council of the Educational-Methodical Association of Osh State University on “_____” _____, 2025.

It was recommended for approval by the decision No. _____ of the Academic Council of Osh State University on “_____” _____, 2025.

It was approved by Order No. _____ of the Rector of Osh State University on “_____” _____, 2025.

Feedback (conclusion) for the Education Standard was obtained from the following foreign experts.

_____ position held, academic title
(name of the expert)

_____ position held, academic title
(name of the expert)

_____ position held, academic title
(name of the expert)

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SECTION 1. GENERAL PROVISIONS

The Education Standard for the training of specialists at the bachelor's level in the 520100 Chemistry program was approved by the order of the Rector of Osh State University.

The education standard for the 520100 Chemistry program was independently developed and approved at Osh State University, taking into account the requirements of higher professional education at the bachelor's level.

The independently developed education standard at Osh State University (hereinafter – the Education Standard) is equivalent to state education standards, has a unified structure of higher professional education requirements, and ensures the unity and quality of education as well as the objectivity of control. It also defines specific requirements for the development of the implemented educational program.

The requirements for the conditions and outcomes of mastering the basic educational programs set out in this education standard are not lower than (i.e., meet or exceed) the relevant requirements of the state education standards.

This education standard was developed with the participation of the following parties:

I. Teaching and academic staff of Osh State University, Institute of Natural Sciences, Physical Education, Tourism, and Agricultural Technologies:

1. Faculty members of the Department of Chemistry and Chemical Technologies.

II. Employers and graduates:

1. "Aero Osh" LLC;
2. Laboratory for testing petroleum products of Jalal-Abad "KPK" LLC;
3. Laboratory research of the Osh City Center for Disease Prevention and State Sanitary-Epidemiological Surveillance;
4. Phytosanitary and Diagnostic Center of the Southern Region;
5. Graduates specializing in Chemical-Ecological and Forensic Expertise.

III. Staff of domestic higher education institutions (colleges):

1. Department of Chemistry and Chemistry Teaching Technology, Kyrgyz State University named after I. Arabaev;
2. Department of Chemistry and Chemical Technologies, Osh Technological University;
3. Medical College of Kyrgyz-Uzbek International University named after B. Sydykov;
4. Department of Chemical Engineering, Faculty of Engineering, Kyrgyz-Turkish Manas University;
5. Department of Chemistry and Chemistry Teaching Technology, Faculty of Biology and Chemistry, Kyrgyz State University named after I. Arabaev.

IV. Staff of foreign higher education institutions (colleges):

1. Department of Chemistry, Ferghana State University;
2. Department of Chemical Technologies, Namangan Engineering and Construction Institute;

3. Department of Chemical Education, A.M. Butlerov Chemical Institute, Kazan Federal University;
4. Department of Chemistry, Bukhara Engineering Technology Institute.

V. Representatives of scientific organizations, academic institutions, and state and public organizations:

1. Laboratory of “Fuel Resources and Coal Processing,” Institute of Natural Resources named after A.S. Dzhamanbaev, Southern Branch of the National Academy of Sciences of the Kyrgyz Republic.

This education standard is based on:

- Decree of the President of the Kyrgyz Republic No. 243 of July 18, 2022 “On measures to increase the potential and competitiveness of higher professional education institutions of the Kyrgyz Republic”;
- Decree of the Cabinet of Ministers of the Kyrgyz Republic No. 654 of November 21, 2022 “On amendments to certain decisions of the Government of the Kyrgyz Republic on granting special status to state higher education institutions”;
- Decree of the Cabinet of Ministers of the Kyrgyz Republic No. 45 of February 5, 2024 “On amendments to certain resolutions of the Government of the Kyrgyz Republic and the Cabinet of Ministers of the Kyrgyz Republic on granting special status to state higher education institutions”;
- Law “On Education” adopted on August 11, 2023;
- Decree No. 371 of July 8, 2024 “On approval of the template of the state educational standard of primary, secondary, and higher professional education of the Kyrgyz Republic”;
- National Qualifications Framework and European Qualification Framework, professional standards, Osh State University Charter, and current regulatory and local documents in force at the time of approval of the education standard.

The procedure for developing, approving, and amending this education standard is regulated by the “Regulation on the Development, Approval, and Amendment of Educational Standards at Osh State University.”

2-БӨЛҮМ. КЫСКАРТУУЛАР

ББМ – билим берүү мекемеси

ББС – билим берүү стандарты

БКФ – баалоо каражаттарынын фонду

ЖАК – жабык акционердик коому

ЖК – жалпы компетенция

ЖКББ – жогорку кесиптик билим берүү

ЖКК – жалпы кесиптик компетенциялар

ЖОЖ - жогорку окуу жайы

КК – кесиптик компетенциялар

КПК – Кыргыз Петролеум Компания

НББП – негизги билим берүү программасы

ОН – окутуунун натыйжасы

ОПК – окутуучу профессордук курам

ОшМУ – Ош мамлекеттик университети

СӨАИ – студенттин өз алдынча иштөөсү

ECTS – кредиттерди которуунун жана топтоонун европалык системасы

SECTION 3. TERMS

The following terms and definitions are used in this Education Standard for higher professional education:

- **Training directions** – a set of educational programs for training specialists, bachelors, and masters in higher professional education, integrated and based on the generality of fundamental training for various profiles.
- **Basic curriculum** – a catalog of disciplines over the full academic period for preparing a student in a specific field or specialty (hereinafter – curriculum). The curriculum includes a mandatory component (basic and university-specific/specialized), regulates the number of credits allocated for mandatory and elective disciplines, and specifies the duration and types of practical training.
- **Bachelor** – a level of higher professional education qualification granting the right to enter a master's program and to engage in professional activities.
- **Distance learning form** – a form of independent learning using information technologies (remote learning).
- **Online learning form** – distance learning in real-time using information technologies.
- **Catalog of disciplines** – disciplines offered by an educational institution for elective courses.
- **Competence** – the predefined social requirements (standards) necessary for effective productive activity in a particular field, acquired by students during their education.
- **Double qualification** – an educational program implemented at the intersection of the education standards of two directions (profiles) or specialties.
- **Credit** – a conventional unit for measuring workload in the main professional educational program.
- **Main educational program** – a set of academic and methodological documents regulating the purpose, expected outcomes, content, and organization of the educational process for the corresponding training direction.
- **Learning outcome** – the competence acquired upon completion of a main educational program or module.
- **Credit-based learning technology** – instruction based on accumulation of credits, allowing students to independently plan the sequence of disciplines and choose courses.
- **Independently developed competences** – competences introduced by the standard developers.
- **Profile** – the focus of an educational program on a specific type and/or object of professional activity.
- **Semester curriculum** – a curriculum used to organize the learning process during a specific academic period (including calculation of teaching staff workload for the semester).
- **Individual student curriculum (ISC)** – defines the student's study plan for the semester, based on the courses offered during that semester.

- **Elective disciplines** – courses included in the student’s individual preparation within the elective component, determined by the educational institution, taking into account socio-economic development features and regional needs.
- **Sectoral education form** – an educational program implemented by several educational institutions.
- **Current internal regulations** – internal normative documents in use at the time of developing this regulation.
- **ECTS** – European Credit Transfer and Accumulation System.
- **Soft skills** – emotional and creative intelligence, effective communication, self-organization, and the ability to approach non-standard situations creatively and critically.
- **STEM skills** – skills in modern technology, engineering, science, and data application and management.
- **Consulting** – professional advisory services provided to individuals, organizations, or companies on various issues.

SECTION 4. SCOPE OF APPLICATION

4.1. This Education Standard (hereinafter – the Education Standard – ES) developed at Osh State University defines the set of requirements for the development and implementation of the main educational programs of higher professional education in the 520100 Chemistry program.

4.2. This Education Standard establishes the requirements for training specialists under the 520100 Chemistry higher professional education programs, and upon successful completion, the “Bachelor” qualification is awarded.

4.3. This ES serves as the basis for developing the basic curricula, syllabi of disciplines and practical training, and programs of the state final certification within the framework of the main educational programs.

4.4. The main users of this Education Standard are:

- The teaching and academic staff of the educational institution, who use the ES as the basis for developing, implementing, and teaching the main educational programs in the 520100 Chemistry program. They also use it to assess the quality of mastering higher professional education programs, update and complement the programs considering advances in science, technology, and the social environment, and systematically monitor the achieved learning outcomes;
- Students, to effectively carry out their studies while mastering the main educational program;
- The administration of the educational institution, academic-methodical associations (sectoral committees), deans of faculties, directors of institutes and colleges, heads of departments, heads of divisions, heads of subject-cycle commissions, and others responsible for the quality of graduate training and organization of the educational process within their competence;
- Examination and state final certification commissions, which evaluate students’ learning achievements and the quality of education;
- Employers in the relevant professional field, to determine the suitability of graduates for employment;
- Organizations financing higher professional education;
- Authorized bodies implementing the accreditation of educational programs in the education sector;
- Representatives of state executive authorities responsible for ensuring compliance with legislation and controlling quality in higher professional education;

- Applicants, to guide them in selecting educational programs.

SECTION 5. STANDARD DURATION AND WORKLOAD OF THE EDUCATIONAL PROGRAM

5.1. Requirements for applicants' education level. Applicants for bachelor's programs in higher professional education must have one of the following documents:

- Certificate of general secondary education;
- Diploma of initial professional education (if accompanied by a document of general secondary education);
- Diploma of secondary professional education;
- Diploma of higher professional education.

5.2. According to this Education Standard, the "Bachelor" qualification can be awarded through the following forms of education:

- Full-time (including online);
- Part-time (external);
- Full-time and part-time combined (evening).

5.3. In training a bachelor in the 520100 Chemistry program, the total workload of the educational program, regardless of the form of study, applied educational technologies, issuance of a double qualification, sectoral education form (implemented by several educational institutions), or individual student curriculum, including accelerated learning, must be at least **240 credits**.

For a double qualification, the program is implemented at the intersection of the two standards, and the total workload of the educational program is increased by at least **60 credits**, extending the study period by no less than **1 year**.

5.4. For full-time study, the standard duration of education for a bachelor, including vacations after the state final certification, is **4 years**.

5.5. For combined or part-time study, the standard duration of education, regardless of the applied educational technologies, is extended by **6 months to 1 year** compared to full-time study.

5.6. In combined and part-time study, the volume of classes must be **no less than 16 hours per week**.

5.7. The duration norms for mastering the program according to the individual student curriculum are determined based on the academic policy of the educational institution and regulatory documents governing the organization of the learning process.

5.8. When organizing the learning process using credit-based educational technology, the workload of each academic discipline is expressed in whole academic credits. The workload of all types of academic work in the curriculum is measured in **ECTS academic credits**, where **1 academic credit = 30 academic hours** (including classroom, independent work, and all forms of assessment). The duration of one academic hour under the credit system is determined by the educational institution, typically **45 minutes**.

5.9. The annual workload for full-time study in higher professional education under the main educational program is **60 credits per year** and **30 credits per semester**.

5.10. For full-time and part-time study, as well as for various forms of distance learning, the annual workload per academic year for bachelor's programs must be **no less than 48 credits**.

5.11. In accelerated programs, the duration of study is determined by the educational institution based on the full or partial re-assessment of previously mastered disciplines (modules) and/or certain types of workplace training.

5.12. Individuals with relevant secondary professional or higher professional education are allowed to master the educational program through accelerated programs, taking into account recognition of prior learning outcomes. The alignment of the profile of secondary professional education with the bachelor's program profile is determined independently by the educational institution.

5.13. When using online learning, it is **not allowed** to conduct all types of practical training and the state final certification entirely online.

SECTION 6. REQUIREMENTS FOR DEVELOPING AND IMPLEMENTING THE MAIN EDUCATIONAL PROGRAM

6.1. The educational institution independently develops higher professional education programs, taking into account labor market needs. The main educational program is developed based on the education standard for the direction/profile, the National Qualifications Framework, sectoral/industry qualification frameworks, and professional standards (if available).

6.2. The objectives of the main educational program (MEP) for the 520100 Chemistry higher professional education program are:

- **Educational objectives:** Provide students with a deep foundation of knowledge in the direction/profile, develop scientific-theoretical and practical skills, and prepare them for professional activity and continuous independent learning.
- **Educational and personal development objectives:** Foster students' social activity, responsibility, civic position, ethical and intellectual culture, self-development, and active participation in public life.

6.3. The relevant structures of the educational institution update the MEP at least once every **five years**, taking into account developments in science, culture, economics, technology, and social environment, and based on stakeholders' recommendations. Updating educational programs includes:

- Developing strategies to ensure the quality of graduate training;
- Periodically monitoring educational programs;
- Developing objective procedures to assess students' knowledge, skills, and competencies of graduates based on employer-agreed requirements;
- Ensuring the quality and competence of teaching staff;
- Providing sufficient resources for program implementation and monitoring their efficient use;

- Continuously conducting self-assessment according to minimum accreditation requirements established by the Cabinet of Ministers of the Kyrgyz Republic;
- Informing the public about results, plans, and innovations.

6.4. The educational institution implementing the program is responsible for:

- Creating a socio-cultural environment;
- Providing conditions for comprehensive development and socialization of students and safeguarding their health;
- Developing the educational process's extracurricular and formative components, including promoting self-management, participation in student organizations, sports and creative clubs, and scientific student societies.

6.5. For each cycle of the educational program, the set of disciplines (modules) and their workload is determined independently by the educational institution (relevant structures: faculty, institute).

6.6. The set of disciplines in the MEP must include a **mandatory (core) component** and an **elective component**. Elective courses are offered for the professional cycle, and the catalog of disciplines is determined by the educational institution (relevant structures: faculty, institute).

6.7. The degree of mandatory study, sequence of mastering, and workload of disciplines is categorized into groups "A," "B," and "C" according to the institution's regulations for organizing the learning process and the appendices of this template.

6.8. The educational institution must ensure students have access to courses (disciplines/modules), provide introductory courses, and help students form their individual learning trajectory by selecting elective courses through surveys. Students develop their individual curriculum with the participation of an academic consultant provided by the institution.

6.9. The educational institution is responsible for informing students of their rights and responsibilities, explaining which disciplines are mandatory, and ensuring that the total workload of selected courses is no less than the workload established in the curriculum.

6.10. The educational institution must consider gender equality, ensure social inclusion, and promote digitalization when developing and implementing the program.

6.11. General requirements regarding students' rights and responsibilities during program implementation:

- Students have the right to choose specific disciplines within the allocated study time according to the educational program;
- Students have the right to consult the institution regarding the selection of disciplines and their impact on future profession/specialty when forming an individual learning trajectory;
- To achieve learning outcomes, students are entitled to develop self-management skills and participate in public organizations, sports and creative clubs, and scientific student societies;
- Students must complete all tasks outlined in the educational program within the established deadlines;
- Weekly student workload, including classroom and independent work, must be **at least 38 hours**. Maximum weekly workload is determined by the institution;

- For full-time study, classroom sessions in bachelor/professional programs must comprise **at least 35%** of total weekly workload;
- Total vacation periods during the academic year should be **7–10 weeks**, including at least **two weeks** of winter break depending on the study period.

SECTION 7. CHARACTERISTICS OF GRADUATES' PROFESSIONAL ACTIVITIES

7.1. Directions of graduates' professional activities

Graduates of the 520100 Chemistry program, “Chemical-Ecological and Forensic Expertise” profile, are capable of performing professional activities in the following areas:

- Scientific study and management of chemical-ecological systems;
- Environmental protection and ensuring sustainable development;
- Conducting chemical-forensic examinations in the field of criminology;
- Providing ecological audit, monitoring, and consulting services;
- Teaching chemistry and ecology subjects in secondary and vocational education institutions;
- Participating in national and international ecological projects and contributing to their implementation.

Graduates can make professional contributions in the following sectors:

- Ensuring ecological safety;
- Conducting chemical and forensic analyses;
- Monitoring compliance with environmental standards and regulations in industrial enterprises;
- Conducting educational activities to promote public ecological awareness.

7.2. Main objects of professional activity

The main objects of professional activity for graduates of this profile include:

- Chemical-ecological systems and assessment of their status;
- Forensic and analytical laboratories and centers;
- Environmental monitoring objects in industrial enterprises and the natural environment;
- Natural resources, raw materials, and various chemical substances (including toxic or residual materials);
- National and international projects aimed at ecological safety;
- Secondary, vocational, and higher education institutions, as well as research organizations.

These objects enable graduates to apply their chemical, ecological, and forensic knowledge and practical skills in various contexts and provide a foundation for professional work in real production, research, and educational settings.

7.3. Types of professional activity

Graduates of the “Chemical-Ecological and Forensic Expertise” profile are capable of performing the following main types of professional activity:

- **Research activity:** Studying relevant chemical, ecological, and forensic issues scientifically, developing and optimizing analytical methods, and publishing results in scientific articles, reports, and recommendations;
- **Project and production activity:** Designing ecological and forensic projects, developing and implementing measures to ensure ecological safety at production sites;
- **Organizational and managerial activity:** Organizing laboratory and production activities, planning and monitoring work processes, and applying teamwork skills;
- **Expert activity:** Conducting chemical and forensic examinations in criminology, toxicology, ecology, product safety, and environmental pollution, preparing and analyzing expert reports.

7.4. Readiness to perform professional duties

A bachelor of the 520100 Chemistry program, “Chemical-Ecological and Forensic Expertise” profile, is prepared to perform professional duties in accordance with the types of professional activity:

1. **Research activity:**

- Conduct in-depth study of chemical and ecological processes, identify patterns, and model them;
- Develop new chemical reagents, technological methods, and analytical instruments, increase their efficiency, and ensure ecological safety compliance;
- Ensure ecological safety and reduce environmental risks using chemical analysis methods;
- Obtain accurate, evidence-based data in forensic and criminalistic examinations using chemical-analytical methods;
- Develop scientifically based methodological recommendations for protection and rational use of natural resources;
- Study, monitor, and evaluate the distribution of chemical substances in the atmosphere, water sources, and soil;
- Participate in scientific activities and regulatory development in chemical safety according to national and international standards.

2. **Project and production activity:**

- Participate in developing monitoring systems using modern analytical methods and equipment to assess and control ecological conditions;
- Select, apply, and ensure the efficiency of modern equipment for chemical and ecological laboratories;
- Evaluate technical and operational characteristics of instruments and equipment scientifically and provide recommendations for optimal use;
- Optimize technological processes used in chemical and forensic examinations and enhance their reliability;
- Actively participate in project development and implementation at production and ecological facilities, considering safety and sustainable development principles.

3. **Organizational and managerial activity:**

- Organize and efficiently manage laboratories conducting chemical, ecological, and forensic examinations;
- Form, lead, and coordinate expert and analytical teams;
- Develop, implement, and control compliance with chemical safety rules at workplaces;

- Develop and implement state or sectoral programs and projects aimed at environmental protection and sustainable development;
- Organize cooperation with state and private institutions, international organizations, and provide expert advice on chemical and ecological safety.

4. **Expert activity:**

- Identify hazardous chemical substances in air, water, soil, and other ecological components, and accurately measure their concentrations using laboratory methods;
- Prepare scientifically grounded, objective, and evidence-based expert reports for forensic, criminalistic, and environmental cases;
- Develop and improve monitoring systems using modern instruments and analytical methods to ensure continuous environmental control;
- Assess the safety levels of chemicals used in industrial and household contexts, develop recommendations to reduce chemical risks, and assist in their implementation;
- Conduct inspections according to national and international chemical and environmental safety standards, prepare analytical reports and recommendations on violations, and cooperate closely with relevant regulatory authorities.

SECTION 8. REQUIREMENTS FOR THE RESULTS OF MASTERING THE EDUCATIONAL PROGRAM

8.1. As a result of mastering the educational program, the graduate must develop the following **general competencies (GC)**:

Directions	Competencies	Learning Outcomes (LO)
Language and communication skills	GC-1: Gives presentations in public; chooses the style and form of speech; expresses and justifies opinions correctly in written and oral forms; presents research results in professional contexts in Kyrgyz, Russian, and foreign languages.	LO-1: Communicates in three languages: in Kyrgyz and Russian at B2 level, and in one foreign language at B1 level within a professional context.
National and universal human values	GC-2: Critically analyzes and evaluates human-civic relations in professional activity; promotes ideas aimed at strengthening statehood philosophy, civic identity, patriotism, universal and national values based on legal culture, and ensures their implementation.	LO-2: Respects universal and national values while maintaining human and national identity, adheres to legality, contributes to their development and dissemination, and demonstrates personal, civic, and legal responsibility in social contexts aligned with the interests of the state.
Soft skills	GC-3: Generates new ideas, adapts to innovations and unexpected situations with creative thinking; applies analytical thinking and critical evaluation in project management and entrepreneurship.	LO-3: Capable of generating ideas, thinking critically, integrating and analyzing alternative perspectives; reasons argumentatively and constructively in professional contexts; self-manages in non-standard situations in entrepreneurship, maintains psychological resilience, and applies research skills.
STEM skills	GC-4: Uses digital media texts,	LO-4: Applies modern information and

Directions	Competencies	Learning Outcomes (LO)
	infographics, fundamental mathematical, engineering, and scientific principles; adapts to new trends in various business environments of the digital and creative economy.	telecommunication technologies and mathematical methods; responds flexibly to te

8.2. A graduate of the 520100 Chemistry program (profile: Chemical-Ecological, Forensic Expertise) must possess the following **general professional competencies (GPC)**:

Competency Number	Content of Self-Developed General Professional Competencies
GPC-1	Capable of planning, organizing, and managing chemical, chemical-ecological, and forensic systems for sustainable development by creatively applying acquired scientific-theoretical and practical knowledge, as well as engaging in continuous professional development according to relevant professional standards.
GPC-2	Capable of solving complex problems using scientific data and information technologies and applying entrepreneurial knowledge and skills effectively in professional activities.
GPC-3	Able to apply the fundamental laws of chemistry and basic chemical concepts to solve specific production tasks.
GPC-4	Able to organize and manage chemical and ecological systems for sustainable development; efficiently use natural resources and strictly comply with national and international environmental protection requirements.

8.3. A graduate with the qualification of “**Bachelor**” in the 520100 Chemistry program (profile: Chemical-Ecological, Forensic Expertise) must possess the following **professional competencies** corresponding to the type of professional activity:

Scientific-Research Activities

Competency Number	Content of Self-Developed Professional Competencies
PC-1	Conduct scientific research through the study and modeling of chemical and ecological processes, directing the obtained results for practical application.
PC-2	Organize experiments and scientifically analyze results for developing and optimizing new chemical reagents, technological methods, and analytical techniques, in compliance with modern requirements.
PC-3	Confidently perform chemical analyses and monitoring to ensure ecological safety, as well as control and assess the distribution of chemical substances in the natural environment.
PC-4	Competently, accurately, and scientifically apply chemical-analytical methods in forensic, criminalistic, and ecological expertise, and perform professional duties with high responsibility in preparing expert conclusions.

Project and Production Activities

Competency Number	Content of Self-Developed Professional Competencies
PC-5	Ability to propose technical solutions for ecological and production facilities and participate in design work—actively contribute to developing innovative solutions to reduce environmental risks and ensure the safety of production processes.
PC-6	Ability to select chemical and ecological equipment, use it correctly, and evaluate it scientifically and technically—ensuring quality work by assessing the effectiveness and safety of applied equipment.
PC-7	Ability to optimize chemical-expertise processes and ensure compliance with technical safety requirements—maintaining safety during production and expertise activities, performing work according to regulations, and enabling effective control.
PC-8	Ability to integrate modern chemical and ecological monitoring methods into projects and implement them in practice—organizing continuous environmental monitoring using analytical and digital technologies.

Organizational-Managerial Activities

Competency Number	Content of Self-Developed Professional Competencies
PC-9	Ability to organize, manage, and coordinate the activities of chemical and ecological laboratories—planning laboratory work correctly, allocating resources efficiently, and ensuring productivity.
PC-10	Ability to ensure chemical safety in work processes and make managerial decisions—ready to maintain safety requirements and make strategic management decisions in production, scientific, or expert environments.
PC-11	Ability to design, manage, and coordinate ecological and scientific projects and collaborate with state or private institutions—working with multidisciplinary teams, managing projects, and establishing sustainable partnerships.

Expert Activities

Competency Number	Content of Self-Developed Professional Competencies
PC-12	Ability to determine the levels of hazardous substances in ecological components through laboratory analyses and accurately evaluate the results scientifically—identifying chemical concentrations in air, water, soil, and other environments, and comparing results with relevant ecological standards to draw conclusions.
PC-13	Ability to conduct chemical and forensic expert analyses and prepare scientifically justified, legally compliant expert conclusions—analyzing evidence in judicial and investigative processes using chemical-analytical methods to produce accurate and evidence-based findings.
PC-14	Ability to develop and effectively implement monitoring, inspection, and control systems to ensure ecological safety—establishing continuous observation

Competency Number	Content of Self-Developed Professional Competencies
	systems, identifying potential hazards in advance, and developing recommendations to mitigate chemical risks.

9.1. Staffing Requirements for Program Implementation

9.1.1. General Staffing Requirements

- Bachelor programs must be delivered by academic staff with relevant higher education, “Master”/“Specialist” degrees, whose teaching aligns with the program profile.
- Staff must actively engage in scientific and scientific-methodological work.
- Teaching staff quality indicators must meet or exceed the state education standard; includes candidates of science, doctors, and PhDs.
- At least 80% of teaching staff must be full-time employees.
- Teachers must upgrade qualifications at least once every 3 years.
- Scientific staff must have appropriate academic degrees and professional experience in their field.

9.1.2. Specific Requirements by Field

- Core and profile courses in chemistry, ecology, and forensic chemistry must be taught by specialists with higher education and relevant academic degrees (Master, Candidate, or Doctor of Science).
- Practical/laboratory lessons require instructors with at least 3 years of experience in production, expertise, or research.
- Collaboration with industry and other universities is encouraged to involve experienced laboratory professionals and researchers.
- At least 40% of instructors should have scientific degrees.
- Faculty must participate in continuous professional development and effectively use modern teaching technologies and digital resources.

9.2. Educational-Methodological and Information Support

9.2.1. Literature and Resources Requirements

- All students must have full and uninterrupted access to essential materials for each course.
- University library collections must include both printed and electronic versions of core and supplementary textbooks.
- Literature must align with the program content, contemporary scientific achievements, and practical requirements.
- Methodological complexes, practicums, lab manuals, and test collections should support both guided and independent student learning.
- Library collections must be continuously updated based on faculty recommendations and program requirements.
- Online access to electronic libraries, journals, databases, and scientific platforms must be guaranteed.

- Digital resources should provide access to professional information, scientific articles, expert reports, and international publications relevant to the program profile.
- Students and faculty must be trained to effectively work with electronic libraries and professional scientific information sources.

9.2.2. Requirements for Electronic Learning Tools

- The institution must provide the necessary equipment and tools to conduct laboratory, subject-specific, and integrated disciplines, as well as practical and research activities in compliance with sanitary, epidemiological, and fire safety standards.
 - Computer equipment and laboratories/classrooms with internet access must be available.
 - Students must have 24/7 access to all electronic resources, learning programs, and the bachelor's curriculum content.
 - Students with disabilities must have full access to distance learning and electronic materials.
 - Laboratories, equipment, and material bases for the Chemistry program must meet modern safety standards and may be provided either by the educational institution itself or through partner production, research, and expert institutions.
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9.2.3. Placement of Electronic Educational Materials on Digital Platforms

- Before the start of each academic year (at least one week prior to classes), all electronic versions of teaching materials—syllabi, working programs, assessment tools, presentations, test sets, and other relevant documents—must be fully available on the institution's digital platforms.
 - For each discipline or module, the following documents must be prepared in electronic format and uploaded to the platform:
 - **Syllabus:** course objectives, topics, and resource requirements.
 - **Working Program:** content structure, methodology, practical work schedule.
 - **Assessment Tools:** evaluation criteria, tests, practical assignments.
 - **Supplementary Materials:** presentations, instructional documents, test sets.
 - Electronic documents should be in standard formats (PDF, DOCX, PPTX) and accessible on mobile devices.
 - Materials must be regularly updated, with the current version reviewed annually.
 - Each course instructor is responsible for ensuring the completeness, format compliance, and accessibility of materials.
-

9.2.4. Requirements for Online Learning Materials

- All teaching materials (syllabi, lectures, practical exercises, tests, and methodological guides) must be fully uploaded to the university's LMS platform or other digital systems.
- Materials must always be accessible to students and updated periodically.
- Continuous remote communication with students should be ensured via email, messengers, forums, and video conferences.
- Task discussions, Q&A sessions, and consultations must be organized consistently online.
- Materials must correspond to the program content, learning objectives, and support students' independent work.

- Integrated systems for evaluating students' knowledge (tests, assignments, and control tasks) must be implemented.
- High-quality, up-to-date methodological materials in online format ensure effective learning, course mastery, and student engagement.

9.3. Requirements for Material and Technical Support of the Educational Process

9.3.1. Requirements for Specialized Classrooms (Laboratories, Computer Rooms, Multimedia Rooms, etc.)

The educational institution implementing the bachelor's degree program must provide students not only with theoretical knowledge but also with practical and research skills through a modern material and technical base. Specialized classrooms must meet the following requirements:

- Equipped laboratories, computer rooms, and multimedia classrooms must be available to ensure high-quality discipline-specific and interdisciplinary training.
- All equipment, instruments, and educational tools in these rooms must fully meet the requirements specified in the working programs of each discipline or module.
- All classrooms and equipment used in the educational process must comply with sanitary-hygienic standards and fire safety regulations.
- Internet-connected computers, interactive whiteboards, multimedia projectors, audio-video devices, and installed educational software must be available.
- Modern laboratory equipment and analytical instruments (especially adapted for chemical, chemical-ecological, and forensic examinations) must be designed to enhance students' practical skills.
- When necessary, real equipment may be replaced by virtual laboratories, simulation models, or functional analogs to ensure continuity of the educational process.
- Special learning conditions must be provided for students with disabilities, including:
 - Physically accessible environments (ramps, wide doors, adapted desks and chairs, etc.);
 - Specialized technical tools (Braille materials, text magnifiers, audio materials);
 - Adapted learning materials and technical support services.

9.3.2. Conditions for Training at Production Sites (Industrial Training)

To develop practical skills necessary for working in chemical, chemical-ecological, forensic examination, and related fields, students must have access to relevant laboratories, equipment, and production facilities. These may be located within the educational institution itself or at partner production enterprises, research centers, environmental, and forensic laboratories.

- Official agreements must be in place with these organizations to ensure high-quality practical and laboratory training.
- During practice, students must be fully provided with personal protective equipment and the necessary technical tools to ensure safety.

9.4. Requirements for Assessing the Quality of Knowledge

The university is fully responsible for the quality of bachelor training and must systematically and objectively assess students' achievements at every stage of the educational process.

Forms and procedures of assessment:

- For each course, forms of current and interim assessment (oral questioning, written assignments, tests, portfolios, etc.) must be developed in advance and officially communicated to students within the first month of the academic year.
- Objective and comprehensive evaluation of knowledge quality is a key requirement for the educational process and serves as an indicator of public and academic trust in the institution.

9.4.1. Types of Assessment

1. **Current Assessment:** Conducted continuously throughout the course or module. It includes homework, tests, practical work, laboratory work, and oral/written checks. This stage aims to determine the student's level of mastery of the material and is carried out by the academic teaching staff.
2. **Interim Assessment:** Conducted at the end of a semester to evaluate overall achievement in a subject or module. Assessment is carried out through exams, credit tests, or project work and provides an opportunity to evaluate comprehensive understanding of the topics.
3. **Final State Certification:** The final stage of bachelor-level education, including state exams and the defense of the graduation qualification work. This stage comprehensively evaluates the graduate's professional competence, ability to conduct independent research, and solve practical problems.

9.4.2. Assessment Tools and Criteria

The **Assessment Tools Fund (ATF)** is a collection of diagnostic instruments used to assess students' competence acquisition.

- Assessment tools must be developed separately for each module and competence goal in the curriculum.
- They must evaluate theoretical knowledge, practical skills, and analytical abilities.
- The ATF includes tests of varying complexity, written assignments, practical work, laboratory reports, projects, and presentations.
- Each assessment material must correspond to the competencies and be clearly targeted.

Assessment Criteria:

- Criteria for evaluating knowledge must be clear, precise, and measurable.
- Scales must objectively assess students' research, analytical, and practical skills.
- Each assignment must specify evaluation criteria and weighting coefficients.
- Assessment is conducted using **formative** (during the process) and **summative** (final) methods and must include consistent feedback.

Legality and Transparency:

- Assessment must comply with the internal regulations of the university and national educational standards.
- Assessment materials must be stored in accordance with confidentiality and ethical requirements.

These requirements ensure the quality of the ATF and accurately determine the graduate's professional competence.

9.5. Requirements for Organizing Student Internships

9.5.1. General Provisions on Internships

Internships conducted within bachelor's degree programs are an integral and essential component of the educational process, aimed at developing and consolidating students' professional competencies.

Internships provide students with the opportunity to apply theoretical knowledge in real practical settings, deepen professional skills, and prepare for employment. They also foster creative and analytical potential, enhance independent work skills, and contribute to professional growth.

Internships are a mandatory component of the educational program and are included in the main curriculum. Students undertake internships after completing the relevant theoretical courses, which ensures successful adaptation to practical environments.

The primary objective of internships is to consolidate students' theoretical knowledge and prepare them for effective application in professional activities.

9.5.2. Types of Internships in Higher Professional Education Programs

During professional higher education programs, the following types of internships are conducted:

- **Adaptation Internship** – helps students adapt to the academic environment of the university.
- **Research Internship** – provides the opportunity to apply scientific and theoretical concepts in practice.
- **Professional-Basic Internship** – consolidates theoretical knowledge with practical skills.
- **Professional-Specialized Internship** – ensures in-depth practical training in a chosen specialty.
- **Industrial Internship** – provides professional experience in real production environments.
- **Pre-Graduation Internship** – focuses on preparing students for final qualification work and evaluating professional readiness.

9.5.3. Requirements for Different Types of Internships

- **Adaptation Internship** – familiarize students with internal procedures, educational resources, and teaching processes; develop initial learning skills.
- **Research Internship** – engage in scientific projects, prepare scientific articles, reports, or abstracts, and actively participate in experimental work.
- **Professional-Basic Internship** – master basic professional skills, learn documentation practices, and develop initial work competencies.
- **Professional-Specialized Internship** – independently perform professional functions, consolidate relevant competencies, and work in real professional settings.
- **Industrial Internship** – work in real production environments based on agreements with enterprises, collaborate with employers, and develop production skills.
- **Pre-Graduation Internship** – collect materials for qualification work, perform independent practical tasks, consolidate professional preparation, and demonstrate full professional competence.

9.6. Final Certification

9.6.1. Requirements for the Comprehensive State Final Examination and Credit Distribution (2 Credits)

Only students who have fully completed all disciplines in the study plan and paid contractual fees on time are eligible to participate in the state final certification.

The examination committee is composed of representatives from the relevant industry, faculty from other higher education institutions, and the university's relevant teaching staff. The committee ensures fair and objective decisions, even in the case of disputes.

9.6.2. Requirements for Qualification Work and Credit Distribution (2 Credits)

The **qualification work** is an independent research project demonstrating the student's theoretical and practical knowledge gained during the educational program.

Specific requirements for the qualification work (520100 – Chemistry, “Chemical-Ecological and Forensic Expertise” profile):

1. Content and Theme

- The topic must fully align with the “Chemical-Ecological and Forensic Expertise” profile and the program's objectives.
- Topics should cover environmental safety, forensic analysis, chemical examination, toxicological assessment, pollution identification, application of analytical methods, and evaluation of their reliability.
- The work should combine theoretical foundations with practical experience and utilize modern scientific and technical data along with verified facts.
- The topic must address practical problems such as improving environmental conditions or enhancing the quality of legal-scientific expertise.

2. Structure and Format

- Introduction (relevance, objectives, tasks)
- Analysis of scientific literature (national and international sources)
- Methodological foundations (research methods, instruments, and laboratory protocols)
- Main section (experimental work, data analysis)
- Conclusions and recommendations
- List of references (compliant with GOST standards)
- Appendices (charts, figures, tables, protocols, etc.)
- The work must comply with formal requirements set by the institution (font, spacing, margins, page count).
- Academic integrity, avoidance of plagiarism, and adherence to professional ethics are mandatory.

3. Volume and Quality

- Typically 40–60 pages, excluding appendices.
- Research must be methodologically grounded, accurate, reliable, and well-supported by evidence.

- The text should be logically structured, with analytical depth, scientific style, and proper language norms.

4. **Research and Practical Significance**

- Propose new methods for expert work.
- Improve analytical techniques for detecting hazardous chemicals.
- Provide reliable data for forensic and environmental expertise.
- Offer solutions aimed at environmental protection and human safety.
- Recommendations must be applicable in real practical conditions.

5. **Autonomy and Responsibility**

- The work must fully reflect the student's independent research and analytical skills.
- Students may participate in laboratory and fieldwork as required by the topic.
- Students must report regularly to their scientific supervisor according to the approved schedule.
- The final result should demonstrate professional readiness, scientific-practical thinking, and creative potential.
- Topics must have practical relevance, addressing local social, economic, environmental, or industry-specific issues.
- The work fosters independent research, creative and scientific thinking, analytical skills, and prepares students for professional practice and competitiveness in the labor market.

10-БӨЛҮМ. БИЛИМ БЕРҮҮ ПРОГРАММАСЫНЫН БАЗАЛЫК ОКУУ ПЛАНЫНЫН ҮЛГҮСҮ

Блоктор	Циклдер	Циклдин багыттары	Дисциплиналар	Кредиттердин топторго бөлүнүшү			Сааттардын бөлүнүшү			1-окуу жылы		2-окуу жылы		3-окуу жылы		4-окуу жылы		...		
				“А”	“В”	“С”	Баары	Аудгор.	СӨАИ	1-семестр	2-семестр	3-семестр	4-семестр	5-семестр	6-семестр	7-семестр	8-семестр	...		
1-блок	1-цикл. Жалпы билим берүү	Тилдик жана коммуникативдик көндүмдөр																		
		Улуттук жана жалпы адамзаттык баалуулуктар																		
		Soft skills көндүмдөр																		
		STEM көндүмдөр																		
	Дене тарбия																			
	2-цикл. Жалпы кесиптик билим берүү	Жалпы кесиптик дисциплиналар																		
	3-цикл. Кесиптик билим берүү	Кесиптик дисциплиналар																		
2-блок	Практикалар																			
3-блок	Мамлекеттик жыйынтыктоочу аттестация																			

Окуу планынын биринчи блогу 3 циклден турат, алар: жалпы билим берүү цикли, жалпы кесиптик билим берүү цикли жана кесиптик билим берүү цикли.

Жалпы билим берүү цикли “Тилдик жана коммуникативдик көндүмдөр”, “Улуттук жана жалпы адамзаттык баалуулуктар”, “Soft skills көндүмдөр (жумшак көндүмдөр)”, “STEM көндүмдөр” аталышындагы багыттарга (дисциплиналардын каталогу) бөлүнгөн. Ар бир багытка 3төн кем эмес

дисциплина сунушталат жана дисциплиналардын каталогун билим берүү уюму аныктайт. Билим алуучулар багыттарга сунушталган дисциплиналарды өз алдынча тандай алат.

Базалык окуу планынын бардык циклдеги окуу дисциплиналары милдеттүүлүк даражасы жана мазмунун өздөштүрүүнүн ырааттуулугу боюнча «А», «В», «С» топторуна бөлүнөт:

«А» – дисциплиналардын ырааттуулугу сакталган, базалык окуу планда көрсөтүлгөн семестрде жана окууга милдеттүү болгон дисциплиналар.

«В» – дисциплиналардын ырааттуулугу мааниге ээ эмес, милдеттүү окууга тийиш. Билим алуучулар бул топтогу дисциплиналарды көрсөтүлгөн окуу жылдарга өз алдынча каалаган семестрлерде пландаштырып окуйт.

«С» – «С» тобуна билим берүү уюму тарабынан кесиптик цикл үчүн дисциплиналардын каталогу (тандоо курстары) сунушталат жана билим алуучулар ар бир каталогдон өз каалосу бир дисциплинаны гана тандап окуйт. Бир каталогго тектеш (бири-бирине байланышкан) 3 (үч) дисциплина сунушталууга тийиш. Бул топтогу дисциплиналардын семестрлери окуу планында так көрсөтүлүүсү керек

«С» тобу базалык окуу планынын «А» тобундагы дисциплиналарды тереңдетүүгө, эмгек рыногунун талаптарын жана илимдин-техниканын жетишкендиктерин эске алуу менен бүтүрүүчүнүн атаандаштыкка жөндөмдүүлүгүн камсыз кылуу үчүн кошумча компетенцияларга ээ болууга мүмкүндүк берет.

«С» – тобундагы дисциплиналар эмгек рыногунун талаптарын жана илимдин-техниканын жетишкендиктерин эске алуу менен ар бир окуу жылында жаңыланып туруусу мүмкүн.

Педагогикалык эмес багыттардын базалык окуу планынын жалпы эмгек сыйымдуулугунун бөлүштүрүлүшү (бакалавриат)

Базалык окуу планынын структурасы		Билим берүү программасынын блокторунун жана топторунун эмгек сыйымдуулугу (кредит)			
		«А»	«В»	«С»	
1-блок	Дисциплиналар		202-216 кредит		
	Циклдер	Жалпы билим берүү цикли	24 кредит		
		Кесиптик цикл	178-192 кредит		
		Жалпы кесиптик билим берүү цикли	-	8 кредит ^{**} (20-25%)	-
		Кесиптик билим берүү цикли	40%-50%	25%-30%	25%-30%
2- блок	Практика	20-30 кредит			
3-блок	Жыйынтыктоочу мамлекеттик аттестация	4-8 кредит			
Билим берүү программасынын жалпы эмгек сыйымдуулугу		240 кредиттен кем эмес			

Эскертүү:

******– “В” тобундагы 8 кредит “Ишкердүүлүктүн негиздери” дисциплинасына 4 кредит жана “Илим изилдөөнүн негиздери” дисциплинасына 4 кредит бөлүнөт.

Бул дисциплиналар туруктуу өнүгүүнүн максаттарына ылайык окутулат.

Жалпы кесиптик дисциплинар циклинин “В” тобунунун эмгек сыйымдуулугу - бекитилген 8 кредитти кошкондо 20-25 % түзөт.

Педагогикалык эмес багыттардын базалык окуу пландарындагы милдеттүү дисциплиналардын циклдер боюнча бөлүштүрүлүшү жана эмгек сыйымдуулугу

Блоктор	Циклдер	Циклдин багыттары	Дисциплиналар	Кредиттердин топторго бөлүнүшү			Сааттардын бөлүнүшү			1-окуу жылы		2-окуу жылы		3-окуу жылы		4-окуу жылы			
				“А”	“В”	“С”	Баары	Аудит.	СӨАИ	1-семестр	2-семестр	3-семестр	4-семестр	5-семестр	6-семестр	7-семестр	8-семестр		
1-блок	1-цикл. Жалпы билим берүү (24 кредит)	Тилдик жана коммуникативдик көндүмдөр	Кыргыз тили		4														
			Орус тили		4														
			Дисциплиналардын 4-каталогу Чет тилдери		4														
		Улуттук жана жалпы адамзаттык баалуулуктар	Дисциплиналардын 1-каталогу (3-тиркеме)		4														
		Soft skills көндүмдөр	Дисциплиналардын 2-каталогу (3-тиркеме)		4														
		STEM көндүмдөр	Дисциплиналардын 3-каталогу (3-тиркеме)		4														
		Кошумча дисциплиналар	Дене тарбия		240-360с														
	2-цикл. Жалпы кесиптик билим берүү	Жалпы кесиптик дисциплиналар	Илим изилдөөнүн негиздери (Туруктуу өнүгүүнүн максаттарына ылайык)		4														
			Ишкердүүлүктүн негиздери (Туруктуу өнүгүүнүн максаттарына ылайык)		4														
	3-цикл. Кесиптик билим берүү	Кесиптик дисциплиналар																	
2-блок	Практикалар (20-30 кредит)																		
3-блок	Мамлекеттик жыйынтыктоочу аттестация (4-8 кредит)																		
Билим берүү программасынын жалпы эмгек сыйымдуулугу				240 кредиттен кем эмес															

Базалык окуу планынын “Жалпы билим берүү цикли” үчүн дисциплиналардын каталогу

Эскертүү: Жалпы билим берүү циклинин “дисциплиналар каталогундагы” дисциплиналар студент тарабынан тандалат.

Каталогдун номери	Каталогдун багыты	Каталогдогу дисциплиналардын аталыштары	Кредиттин көлөмү
Дисциплиналардын 1-каталогу	Улуттук жана жалпы адамзаттык баалуулуктар багыты	Ата мекен тарыхы, улуттук баалуулуктар жана маданият	4
		Философия, улуттук жана жалпы адамзаттык баалуулуктардын философиясы	
		Кыргызстандын географиясы	
		Кесиптик чөйрөдөгү экологиялык билим жана маданият	
		Манас таануу	
Дисциплиналардын 2-каталогу	Soft skills көндүмдөрү	...	4
		Долбоордук практикум	
		Сынчыл ой жүгүртүү, ой жүгүртүүнү дизайндоо	
		Өзүн-өзү тарбиялоо жана психология	
Дисциплиналардын 3-каталогу	STEM көндүмдөр	...	4
		Тармактык математика	
		Кесиптик ишмердиктеги санарип технологиялары	
		Заманбап табигый билим берүүнүн концепциясы	
Дисциплиналардын 4-каталогу	Тилдик жана коммуникативдик көндүмдөр	...	4
		Англис тили	
		Кытай тили	
		Корей тили	
		Немец тили	
....			