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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE
LUMUMBA
RUDN University
Faculty of Science**

(educational division (faculty/institute/academy) as higher education programme developer)

Approved at the meeting of the Academic
Council of RUDN University
Protocol No. 1
January 22, 2024

(date, month, year)

Opened by order of the Rector of
RUDN University
No. 111
February 19, 2024

(date, month, year)

PROFESSIONAL EDUCATION PROGRAMME OF HIGHER EDUCATION

Field of Studies/Speciality:

04.04.01 Chemistry

(field of studies/speciality code and title)

Profile/Specialisation:

Bioenergies and biorefineries

(higher education programme title)

The Educational Programme is developed in compliance with:

Educational Standard of RUDN University, approved by Order of the Rector No. 371 dated
May 21, 2021

Level of education:

master's

(bachelor's/specialist's/master's – to fill in the required)

Graduate's Qualification:

Master

(graduate's qualification in compliance with the order of the Ministry of Education and Science of Russian Federation
dated September 12, 2013, No. 1061)

Length of Educational Programme:

2 years

(full-time education)

-

(part-time education)

-

(correspondence education)

Information about the specifics of the programme: **Network form of education – joint
educational programme with L.N. Gumilyov Eurasian National University**

AGREED by:

Head
of Educational Programme
L.G. Voskressensky

Chairperson
of Didactic Council
L.G. Voskressensky

Head
of Educational Department
L.G. Voskressensky

(signature)

(signature)

(signature)

(day, month, year)

(day, month, year)

(day, month, year)

2025

1. EDUCATIONAL PROGRAMME GOAL

The Master's Educational Programme "Bioenergies and Biorefineries" in the direction of training 04.04.01 "Chemistry" is aimed at providing students with conditions for: acquiring the necessary level of knowledge, skills, experience of professional activity; formation of general, general professional and professional competences; obtaining high-quality fundamental and professional training in the field of chemistry and related fields, competitive in the labor market, and be able successfully to solve professional tasks in the research field of activity.

2. EDUCATIONAL PROGRAMME RELEVANCE, SPECIFICITY, AND UNIQUENESS

The Master's Educational Programme "Bioenergies and Biorefineries" is aimed at obtaining and forming students' modern ideas about the main trends in the development of modern chemistry, the latest methods of physicochemical analysis, the nature and the phenomena which underlie the methods of obtaining, identification, and study of properties of substances and materials, and also includes independent scientific research within the framework of the scientific direction of the profile department.

Training is carried out both by the leading representatives of the Organic Chemistry Department of RUDN University and by inviting leading professors of foreign universities, recognized experts in this field.

Form of implementation: full-time.

Lectures and master classes of inviting world-class foreign scientists, joint creative projects and conferences are regularly held.

3. LABOUR MARKET NEEDS FOR PERSONNEL TRAINING IN EDUCATIONAL PROGRAMME PROFILE

The graduates of the Master's Educational Programme "Bioenergies and Biorefineries" in the direction of training 04.04.01 "Chemistry" are able to solve the tasks of scientific activity in the field of chemical and related profile, requiring specialists with higher chemical education. The graduates of the program can work as:

- employees of scientific and educational organizations, laboratories of chemical, biochemical, chemical and pharmaceutical industries;
- researchers in scientific and educational organizations;
- teachers.

The graduates in the direction of training 04.04.01 "Chemistry" can work in positions provided for by the legislation of the Russian Federation and departmental documents for specialists with higher professional education, taking into account the profile of training and work experience.

4. SPECIAL REQUIREMENTS FOR POTENTIAL APPLICANTS

Persons who possess a state document on higher education, along with the appropriate supplement that verifies the applicant's qualification as a bachelor, specialist or master in one of the natural science fields or specialties, must also provide a document confirming passing

an international certification exam in English at level B2, including testing in at least two types of speech activity and should have been issued no later than 3 years prior to the date of submission. In the absence of the required document for the international certification exam, a mandatory oral interview in English will be conducted. The interview will include test materials related to business communication and the specific direction/profile/specialty of the future applicant. The interview will be conducted in person and will assess two types of speech activities (reading and listening), similar to the current formats of certification exams (the IELTS, band 6-6.5), at the Department of Foreign Languages of the Science Faculty. Based on the results of this testing, the commission will prepare a protocol detailing the applicant's level of proficiency in English. Applicants who successfully pass the portfolio competition in the training direction 04.04.01 "Chemistry" will be allowed to pursue the Educational Programme.

5. FEATURES OF EDUCATIONAL PROGRAMME IMPLEMENTATION

5.1. E-learning, and distance learning technologies can be partially used in the implementation of the Master's Educational Programme.

5.2. The implementation language of the Master's Educational Programme is English.

5.3. The Master's Educational Programme does not provide for the training of people with disabilities and disabled persons.

5.4. The Master's Educational Programme is implemented by the RUDN University together with L.N. Gumilyov Eurasian National University.

The information about partner organizations involved in the implementation of the Educational Programme

| Name of partner organisation | Interaction functionality (<i>students' research at a partner organization, internships, etc.</i>) |
|--|---|
| A. N. Nesmeyanov Institute of Organoelement Compounds of Russian Academy of Sciences | scientific work of the students on the basis of a partner organization, practice |
| A.V.Topchiev Institute of Petrochemical Synthesis | scientific work of the students on the basis of a partner organization, practice |
| L.N. Gumilyov Eurasian National University | scientific work of the students on the basis of a partner organization, practice, implementation of a master's thesis |
| King Fahd University of Petroleum & Minerals (KFUPM) | scientific work of the students on the basis of a partner organization, practice, implementation of a master's thesis |
| Xi'an Jiaotong University | scientific work of the students on the basis of a partner organization, practice, implementation of a master's thesis |
| Universidade Federal do Pará | scientific work of the students on the basis of a partner organization, practice, implementation of a master's thesis |
| Universidade Federal de Pelotas | scientific work of the students on the basis of a partner organization, practice, implementation of a master's thesis |

5.5. The information on the planned introductory/advanced field internships and (or) research & development internships

| Internship* | Internship location (<i>organization name and location</i>) |
|---|--|
| Scientific research internship (educational, stationary/visiting) | King Fahd University of Petroleum & Minerals (KFUPM) Xi'an Jiaotong University Universidade Federal do Pará Universidade Federal de Pelotas A. N. Nesmeyanov Institute of Organoelement Compounds of |

| Internship* | Internship location (<i>organization name and location</i>) |
|--|--|
| | RAS The Topchiev Institute of Petrochemical Synthesis of RAS RIC RUDN, Moscow CUC PCR RUDN, Moscow L.N. Gumilyov Eurasian National University |
| Teaching practical training (internship, stationary/visiting) | L.N. Gumilyov Eurasian National University |
| Pre-graduation practical training (internship, stationary/visiting) | King Fahd University of Petroleum & Minerals (KFUPM) Xi'an Jiaotong University Universidade Federal do Pará Universidade Federal de Pelotas A.N. Nesmeyanov Institute of Organoelement compounds RAS The Topchiev Institute of Petrochemical Synthesis RAS RIC RUDN, Moscow CUC PCR RUDN, Moscow L.N. Gumilyov Eurasian National University |

* The section should indicate the type (introductory/advanced field internship), the kind (orientation, technological, research, pre-graduate, etc.), and the mode (intramural/ extramural) of the internship.

6. CHARACTERISTICS OF EDUCATIONAL PROGRAMME GRADUATE'S PROFESSIONAL ACTIVITIES

6.1. The field(s) of professional activities of the Educational Programme graduate, where he/she can carry out his/her professional activities:

- 40 Cross-cutting types of professional activity in industry (in the field of scientific and technical developments and the introduction of chemical products for various purposes).
- 01 Science and education

Graduates can carry out professional activities in other areas of professional activity and (or) areas of professional activity, provided that their level of education and acquired competencies meet the requirements for the qualification of an employee.

6.2. The type(s) of professional activities tasks, which the graduate is trained to solve when mastering the Educational Programme:

- scientific and research.
- pedagogical

6.3. The list of generalized labour functions and labour functions which are related to the professional activities of the Educational Programme graduate and are taken into account in the course of its development.*

| Code and title of occupational standard | Generalized labour functions | | | Labour functions | | |
|--|-------------------------------------|--|---------------------|---|--------|--------------------------------|
| | Code | Title | Qualification level | Type | Code | Qualification level (sublevel) |
| 40.011 "Specialist in research and development" | B | Conducting research and development work in the study of separate topics | 6 | Conducting patent research and determining the characteristics of products (services) | B/01.6 | 6 |
| | | | | Carrying out work on the processing and analysis of scientific and technical | B/02.6 | 6 |

| Code and title of occupational standard | Generalized labour functions | | | Labour functions | | |
|---|------------------------------|--|---------------------|--|--------|--------------------------------|
| | Code | Title | Qualification level | Type | Code | Qualification level (sublevel) |
| | | | | information and research results | | |
| | | | | Leadership of a group of employees in the study of independent topics | B/03.6 | 6 |
| | C | Conducting research and development work on the subject of the organization | 6 | Implementation of scientific management of research on individual tasks | C/01.6 | 6 |
| | D | Implementation of scientific management in the relevant field of knowledge | 7 | Formation of new directions | D/01.7 | 7 |
| | | | | | | |
| 40.008 "Specialist in the organization and management of research and development work" | A | Organization of research work on assigned topics | 6 | Development and organization of activities according to the thematic plan | A/01.6 | 6 |
| | B | Organization of work to carry out research and development work | 6 | Organization of research work on problems provided for by the thematic plan of the sector (laboratory) | B/01.6 | 6 |
| 01.001 "Teacher “ (pedagogical activity in the field of preschool, primary general, basic general, secondary general education) (educator, teacher)" | A | Pedagogical activities for the design and implementation of the educational process in educational organizations of preschool, primary general, basic general, secondary general education | 6 | General pedagogical function. Education | A/01.6 | 6 |
| | | | | Educational activities | A/02.6 | 6 |
| | | | | Developmental activities | A/03.6 | 6 |
| | B | Pedagogical activities for the design and implementation of basic general education programs | 6 | Pedagogical activities for the implementation of basic and secondary general education programs | B/03.6 | 6 |
| 01.003 | A | Teaching in | 6 | Organization of | A/01. | 6.1 |

| Code and title of occupational standard | Generalized labour functions | | | Labour functions | | |
|---|------------------------------|---|---------------------|--|--------|--------------------------------|
| | Code | Title | Qualification level | Type | Code | Qualification level (sublevel) |
| "Teacher of additional education for children and adults" | | additional general education programs | | student activities aimed at mastering the additional general education program | 6 | |
| | | | | Pedagogical control and assessment of mastering the additional general education program | A/04.6 | 6.1 |
| | | | | Development of software and methodological support for the implementation of an additional general education program | A/05.6 | 6.2 |
| | B | Organizational and methodological support for the implementation of additional general education programs | 6 | Organizational and pedagogical support of methodological activities of teachers of additional education | B/02.6 | 6.3 |
| | | | | Monitoring and assessing the quality of implementation of additional general education programs by teaching staff | B/03.6 | 6.3 |

* The wording of labour functions is taken from the relevant Occupational Standards.

7. REQUIREMENTS FOR EDUCATIONAL PROGRAMME OUTCOMES

7.1. Upon completion of the Educational Programme, the graduate is expected to acquire the following Generic Competences (GCs):

| Code and descriptor of generic competence | Code and competence level indicator |
|---|---|
| GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-1.1. Ability to analyze the problem task as a system, identifying its components and relationships between them; GC-1.2. Ability to identify lack in information needed to solve a problem task and to design processes to address them; GC-1.3. Ability to critically evaluate the reliability of information sources, to work with conflicting information from different sources; GC-1.4. Ability to develop and substantively argue a strategy for solving a problem situation based on a systematic and interdisciplinary approach; GC-1.5. Ability to use logical and methodological tools for a critical |

| Code and descriptor of generic competence | Code and competence level indicator |
|--|---|
| | assessment of modern concepts of a philosophical and social nature in its subject area |
| GC-2. Ability to manage a project at all stages of its life cycle. | <p>GC-2.1. Ability to formulate, on the basis of the posed problem, a project task and a way to solve it through the implementation of project management;</p> <p>GC-2.2. Ability to develop the project concept within the framework of the indicated problem: to formulate the goal, objectives, to justify the relevance, significance, expected results and possible areas of their application;</p> <p>GC-2.3. Ability to plan the necessary resources, including taking into account their replaceability;</p> <p>GC-2.4. Ability to develop a project implementation plan using planning tools;</p> <p>GC-2.5. Ability to monitor the progress of the project, to correct deviations, to make additional changes to the project implementation plan, to clarify the areas of responsibility of the project participants</p> |
| GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | <p>GC-3.1. Ability to develop a strategy of cooperation and on its basis organize the selection of team members to achieve the goal;</p> <p>GC-3.2. Ability to plan and correct the work of the team taking into account the interests, behavioral characteristics and opinions of its members;</p> <p>GC-3.3. Ability to resolve conflicts and contradictions in business communication taking into account the interests of all parties;</p> <p>GC-3.4. Ability to organize discussions on a given topic and discussion of the results of the team's work with the involvement of opponents of the developed ideas;</p> <p>GC-3.5. Ability to plan teamwork, distribute assignments and delegate authority to team members</p> |
| GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | <p>GC-4.1. Ability to establish and develop professional contacts in accordance with the needs of joint activities, including the exchange of information and the development of a common strategy for interaction.;</p> <p>GC-4.2. Ability to compile, translate and edit various academic texts (abstracts, essays, reviews, articles, etc.);</p> <p>GC-4.3. Ability to present the results of academic and professional activities at various social events, including collections, choosing the most appropriate format;</p> <p>GC-4.4. Ability to argue and constructively defend the positions and ideas in academic and professional discussions in the state language of the Russian Federation and a foreign language</p> |
| GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | <p>GC-5.1. Ability to analyze the most important ideological and value systems formed in the course of historical development; substantiates the relevance of their use in social and professional interaction;</p> <p>GC-5.2. Ability to build social and professional interaction, taking into account the characteristics of the main forms of scientific and religious consciousness, business and general culture of representatives of other ethnic groups and confessions, various social groups;</p> <p>GC-5.3. Ability to ensure the creation of a non-discriminatory environment for interaction when performing professional tasks</p> |
| GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | <p>GC-6.1. Ability to evaluate their resources and their limits (personal, situational, temporary), optimally use them for the successful completion of the assigned task;</p> <p>GC-6.2. Ability to determine the priorities of professional growth and ways to improve their own activities based on self-assessment according to the selected criteria;</p> <p>GC-6.3. Ability to build a flexible professional trajectory using the tools</p> |

| Code and descriptor of generic competence | Code and competence level indicator |
|---|--|
| | of continuing education, taking into account the accumulated experience of professional activity and dynamically changing requirements of the labor market |
| GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. | <p>GC-7.1. Ability to use digital technologies and methods of searching, processing, analyzing, storing and presenting information in the field of chemistry.</p> <p>GC-7.2. Ability to develop the conception of digital technologies and methods of searching, processing, analyzing, storing and presenting information within the framework of the designated problem: to be able to formulate the purpose, objectives, justify the relevance, significance, expected results and possible areas of their application in the digital economy and modern corporate information culture.</p> <p>GC-7.3. Ability to monitor the use of digital technologies and methods of search, processing, analysis, storage and presentation of information in the field of chemistry, corrects deviations, makes additional changes to the plan for the use of digital technologies.</p> |

7.2. Upon completion of the Educational Programme, the graduate is expected to acquire the following general professional competences (GPCs):

| Code and descriptor of general professional competence | Code and competence level indicator |
|--|---|
| GPC-1. Ability to carry out complex experimental and computational-theoretical studies in the chosen field of chemistry or related sciences using modern equipment, software and databases for professional purposes. | <p>GPC-1.1. Ability to use existing and develop new methods for obtaining and characterizing substances and materials for solving problems in the chosen field of chemistry or related sciences;</p> <p>GPC-1.2. Ability to use modern equipment, software and professional databases for solving problems in the chosen field of chemistry or related sciences;</p> <p>GPC-1.3. Ability to use modern computational and theoretical methods of chemistry to solve professional problems</p> |
| GPC-2. Ability to analyze, interpret and generalize the results of experimental and computational-theoretical work in the chosen field of chemistry or related sciences. | <p>GPC-2.1. Ability to carry out a critical analysis of the results of own experimental and computational-theoretical works and to interpret them correctly;</p> <p>GPC-2.2. Ability to formulate summary and conclusions based on the results of the analysis of literature data, own experimental and computational-theoretical works in the chosen field of chemistry or related sciences</p> |
| GPC-3. Ability to use computational methods and adapt existing software products to solve problems of professional activity. | <p>GPC-3.1. Ability to use modern IT-technologies in the collection, analysis, and presentation of chemical profile information;</p> <p>GPC-3.2. Ability to use standard and original software products, if necessary, adapting them to solve the problems of professional activity;</p> <p>GPC-3.3. Ability to use modern computational methods for processing chemical experiment data, modeling the properties of substances (materials) and processes with their participation</p> |
| GPC-4. Ability to prepare publications, participate in | GPC-4.1. Ability to present the results of the research in the form of scientific publications (abstract, paper, review) in Russian and in English; |

| Code and descriptor of general professional competence | Code and competence level indicator |
|---|--|
| professional discussions, present the results of professional activities in the form of scientific and popular science reports. | GPC-4.2. Ability to present the results of the research orally in Russian and English |

7.3. Upon completion of the Educational Programme, the graduate is expected to acquire the following professional competences (PCs)* :

| Code and descriptor of professional competence | Code and competence level indicator | Code and title of occupational standard for relevant PC |
|--|---|---|
| PC-1. Ability to develop a work plan and to choose adequate methods for solving research problems in the chosen field of chemistry, chemical technology or sciences related to chemistry | <p>PC-1.1. Ability to prepare a general plan of research and detailed plans for individual stages;</p> <p>PC-1.2. Ability to select experimental and calculation-theoretical methods for solving the problems based on the available material and time resources</p> | 40.011 Professional Standard "Research and Development Specialist", approved by Order of the Ministry of Labor and Social Protection of the Russian Federation No. 121Н dated March 4, 2014 (registered by the Ministry of Justice of the Russian Federation on March 21, 2014, registration No. 31692) |
| PC-2. Ability, based on a critical analysis of the results of research projects and research development projects, to evaluate the prospects for their practical application and continuation of work in the chosen field of chemistry, chemical technology or sciences related to chemistry. | <p>PC-2.1. Ability to systematize information obtained in the course of research and development, to analyze it and compare it with literature data;</p> <p>PC-2.2. Ability to determine possible directions for the development of work and prospects for the practical application of the obtained results.</p> | |
| PC-3. Ability to carry out pedagogical activity. | <p>PC-3.1. Ability to conduct theoretical and practical classes on the program profile;</p> <p>PC-3.2. Ability to organize and manage project activities of students;</p> <p>PC-3.3. Ability to apply the norms of professional ethics in its activities, to ensure the confidentiality of information about the subjects of educational relations obtained in the</p> | 01.001 Professional standard "Teacher (pedagogical activity in the field of preschool, primary general, |

| Code and descriptor of professional competence | Code and competence level indicator | Code and title of occupational standard for relevant PC |
|--|--|---|
| PC-4. Ability to provide organizational and methodological support for the educational process. | process of professional activities. | basic general, secondary general education) (educator, teacher)", approved by order of the Ministry of Labor and Social Protection of the Russian Federation dated October 18, 2013 No. 544n with corrections dated 25.12.2014 (registered by the Ministry of Justice of the Russian Federation on December 6, 2013, registration № 30550) 01.003 Professional standard "Teacher of additional education for children and adults", approved by order of the Ministry of Labor and Social Protection of the Russian Federation dated September 8, 2021 No. 652n |
| | PC-4.1. Ability to develop elements of discipline programs in accordance with regulations in the field of education; PC-4.2. Ability to carry out the selection of pedagogical and other technologies, including information and communication technologies, used in the development of basic and additional educational programs and their elements. | |

*The Educational Programme's developer formulates the PC, taking into account the requirements of occupational standards and the Educational Programme field of study.

8. MATRIX OF COMPETENCES that students acquire when mastering the Educational Programme "Bioenergies and Biorefineries" in the field of studies / speciality 04.04.01 «Chemistry»

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|----------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| Block 1. | Disciplines (modules) | | | | | | | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|----------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| B1.O | Mandatory part | | | | | | | |
| B1.O.01 | Core component | | | | | | | |
| B1.O.01.01 | Actual problems of modern chemistry | GC-1.1, GC-1.2, GC-1.3, GC-1.4, GC-1.5 | | | | | GC-6.1; GC-6.2; GC-6.3 | |
| B1.O.01.02 | Higher education pedagogy | | GC-2.1, GC-2.2, | | | | GC-6.1, GC-6.2, | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| | | | CG-2.3, GC-2.4, GC-2.5 | | | | GC-6.3 | |
| B1.O.01.03 | Psychology of management | GC-1.1, GC-1.2, CG-1.3, GC-1.4, GC-1.5 | | GC-3.1, GC-3.2, CG-3.3, GC-3.4, GC-3.5 | | GC-5.1, GC-5.2, GC-5.3 | GC-6.1; GC-6.2; GC-6.3 | |
| B1.O.01.04 | History and philosophy of science | GC -1.1, GC -1.2, GC - | | | | GC -5.1, GC -5.2, | GC -6.1, GC -6.2, | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|----------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| | | 1.3, GC -1.4, GC -1.5 | | | | GC -5.3 | GC -6.3 | |
| B1.O.01. DV.01 | Foreign/Russian language in professional activity | | | GC-3.1; GC-3.2 | GC-4.1; GC-4.2; GC-4.3; GC-4.4 | GC-5.1; GC-5.2; GC-5.3 | | |
| B1.O.02 | Variable component | | | | | | | |
| B1.O.02.01 | Bioenergy | | GC-2.1, GC-2.2, | | | | | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| | | | GC-2.3, GC-2.4, GC-2.5 | | | | | |
| B1.O.02.02 | Modern organic synthesis and pharmacology | | | | | | | |
| B1.O.02.03 | Alternative/new tools for organic synthesis | | | | | | | |
| B1.O.02.04 | Bioproducts, Biomaterials and Biorefineries | | | | | | | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|------------|--|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| B1.O.02.05 | Advanced Organic Synthesis | | | | | | | |
| B1.O.02.06 | Catalyst (nanomaterials) design and applications | | | | | | | |
| B1.O.02.07 | Catalysis: from Basic principles to applications. Homogeneous, Heterogeneous, PhotoCatalysis, Biocatalysis, Electrocatalysis | | | | | | | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| B1.O.02.08 | Experimental lab 1: Flow synthesis and alternative technologies | | | GC-3.3 | | | | |
| B1.O.02.09 | Experimental lab 2: Biorefineries and Bioproducts | | | GC-3.3, GC-3.4, GC-3.5 | | | | |
| B1.O.02.10 | Experimental lab 3: Advanced Organic Synthesis | | | | | | | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|--------------|--|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| B1.O.02.11 | Artificial intelligence and additive technologies in chemistry | | | | | | | GC-7.1, GC-7.2, GC-7.3 |
| B1.O.V.01 | <i>Elective disciplines</i> | | | | | | | |
| B1.O.V.01.01 | Emerging contaminants: from fate to environmental remediation | | | | | | | |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|---------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| B1.O.V.01.02 | The method of working with databases | | | | | | | GC-7.1, GC -7.2, GC -7.3 |
| B2 | Internship | | | | | | | |
| B2.O.01.01(S) | Student Scientific- Research work | GC-1.1, GC -1.2, GC -1.3, GC -1.4 | GC -2.1, GC -2.2, GC -2.3, GC -2.4, | GC -3.4 | GC -4.1, GC -4.2, GC -4.3, GC -4.4 | | GC -6.1 | GC -7.1, GC -7.2, GC -7.3 |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|-----------------|---|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| | | | GC -2.5 | | | | | |
| B2.O.01.02 (Ed) | Teaching practice | | GC-2.1; GC-2.2 | | | | GC -6.1; GC -6.2; GC -6.3 | |
| B2.O.01.03(Pg) | Pre-graduation practical training | GC -1.1, GC -1.2, GC -1.3, GC -1.4 | GC -2.1, GC -2.2, GC -2.3, GC -2.4, | GC -3.3, GC -3.4, GC -3.5 | GC -4.1, GC -4.2, GC -4.3, GC -4.4 | GC -5.1, GC -5.2, GC -5.3 | GC -6.1 | GC -7.1, GC -7.2, GC -7.3 |

| Code | Courses/modules that form students' competences | GENERIC COMPETENCES | | | | | | |
|-----------|--|--|--|--|---|--|---|--|
| | | GC-1. Ability to carry out critical analysis of problem tasks applying a systematic approach, to develop an action strategy. | GC-2. Ability to manage a project at all stages of its life cycle. | GC-3. Ability to organize and manage the work of the team, developing a team strategy to achieve the goal. | GC-4. Ability to apply modern communication technologies, including foreign language(s), for academic and professional interaction. | GC-5. Ability to analyze and perceive the diversity of cultures in the process of intercultural interaction. | GC-6. Ability to identify and implement the priorities of their own activities and self-development based on self-assessment. | GC-7. Ability to look for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data. |
| | | | GC -2.5 | | | | | |
| B3 | Final State Examination | | | | | | | |
| B3.01 | Writing, preparation for the graduate qualification work defense and graduate qualification work defense | GC-1.1, GC -1.2, GC -1.3, GC -1.4, GC -1.5 | GC -2.1, GC -2.2, GC -2.3, GC -2.4, GC -2.5 | GC -3.1, GC -3.2, GC -3.3, GC -3.4, GC -3.5 | GC -4.1, GC -4.2, GC -4.3, GC -4.4 | GC -5.1, GC -5.2, GC -5.3 | GC -6.1, GC -6.2, GC -6.3 | GC -7.1, GC -7.2, GC -7.3 |

| Code | Courses/modules that form students' competences | GENERAL PROFESSIONAL COMPETENCES | | | |
|-----------------|--|---|--|--|--|
| | | GPC-1. Ability to carry out complex experimental and computational-theoretical studies in the chosen field of chemistry or related sciences using modern equipment, software and databases for professional purposes. | GPC-2. Ability to analyze, interpret and generalize the results of experimental and computational-theoretical work in the chosen field of chemistry or related sciences. | GPC-3. Ability to use computational methods and adapt existing software products to solve problems of professional activity. | GPC-4. Ability to prepare publications, participate in professional discussions, present the results of professional activities in the form of scientific and popular science reports. |
| Block 1. | Disciplines (modules) | | | | |
| B1.O | Mandatory part | | | | |
| B1.O.01 | Core component | | | | |
| B1.O.01.01 | Actual problems of modern chemistry | GCP -1.1, GCP -1.2, GCP -1.3 | GCP -2.1, GCP -2.2 | | GCP -4.1, GCP -4.2 |
| B1.O.01.02 | Higher education pedagogy | | | | |
| B1.O.01.03 | Psychology of management | | | | |
| B1.O.01.04 | History and philosophy of science | | GCP -2.1, GCP -2.2 | | |
| B1.O.01.DV.01 | Foreign/Russian language in professional activity | | | | GCP -4.1, GCP -4.2 |
| B1.O.02 | Variable component | | | | |
| B1.O.02.01 | Bioenergy | GCP -1.1, GCP -1.2, GCP -1.3 | GCP -2.1 | GCP -3.1 | |
| B1.O.02.02 | Modern organic synthesis and pharmacology | | GCP -2.1, GCP -2.2 | | |
| B1.O.02.03 | Alternative/new tools for organic synthesis | GCP -1.1, GCP -1.2 | GCP -2.1, GCP -2.2 | | |
| B1.O.02.04 | Bioproducts, Biomaterials and Biorefineries | | GCP -2.1 | GCP -3.1 | |
| B1.O.02.05 | Advanced Organic Synthesis | GCP -1.1, GCP -1.2 | GCP -2.1, GCP -2.2 | | |
| B1.O.02.06 | Catalyst (nanomaterials) design and applications | GCP -1.1 | GCP -2.1 | GCP -3.1, GCP -3.2 | |
| B1.O.02.07 | Catalysis: from Basic principles to applications. Homogeneous, Heterogeneous, PhotoCatalysis, Biocatalysis, Electrocatalysis | GCP -1.1, GCP -1.3 | GCP -2.1 | | |
| B1.O.02.08 | Experimental lab 1: Flow synthesis and alternative technologies | GCP -1.1, GCP -1.2, GCP -1.3 | GCP -2.1 | | |
| B1.O.02.09 | Experimental lab 2: Biorefineries and Bioproducts | GCP -1.1, GCP -1.2 | GCP -2.1 | | |
| B1.O.02.10 | Experimental lab 3: Advanced Organic Synthesis | GCP -1.1 | GCP -2.1, GCP -2.2 | GCP -3.3 | |

| Code | Courses/modules that form students' competences | GENERAL PROFESSIONAL COMPETENCES | | | |
|------------------|--|---|--|--|--|
| | | GPC-1. Ability to carry out complex experimental and computational-theoretical studies in the chosen field of chemistry or related sciences using modern equipment, software and databases for professional purposes. | GPC-2. Ability to analyze, interpret and generalize the results of experimental and computational-theoretical work in the chosen field of chemistry or related sciences. | GPC-3. Ability to use computational methods and adapt existing software products to solve problems of professional activity. | GPC-4. Ability to prepare publications, participate in professional discussions, present the results of professional activities in the form of scientific and popular science reports. |
| B1.O.02.11 | Artificial intelligence and additive technologies in chemistry | | | GCP -3.1, GCP -3.2, GCP -3.3 | |
| <i>B1.O.V.01</i> | <i>Elective disciplines</i> | | | | |
| B1.O.V.01.01 | Emerging contaminants: from fate to environmental remediation | | | | |
| B1.O.V.01.02 | The method of working with databases | | | | |
| B2 | Internship | | | | |
| B2.O.01.01(S) | Student Scientific- Research work | GCP -1.1, GCP -1.2, GCP -1.3 | GCP -2.1, GCP -2.2 | GCP -3.1, GCP -3.2, GCP -3.3 | GCP -4.1, GCP -4.2 |
| B2.O.01.02 (Ed) | Teaching practice | | | | |
| B2.O.01.03(Pg) | Pre-graduation practical training | GCP -1.1, GCP -1.2, GCP -1.3 | GCP -2.1, GCP -2.2 | GCP -3.1, GCP -3.2, GCP -3.3 | GCP -4.1, GCP -4.2 |
| B3 | Final State Examination | | | | |
| B3.01 | Writing, preparation for the graduate qualification work defense and graduate qualification work defense | GCP -1.1, GCP -1.2, GCP -1.3 | GCP -2.1, GCP -2.2 | GCP -3.1, GCP -3.2, GCP -3.3 | GCP -4.1, GCP -4.2 |

| Code | Courses/modules that form students' competences | PROFESSIONAL COMPETENCES | | | |
|------------------|--|--|--|--|---|
| | | PC-1. Ability to develop a work plan and to choose adequate methods for solving research problems in the chosen field of chemistry, chemical technology or sciences related to chemistry | PC-2. Ability, based on a critical analysis of the results of research and development, to evaluate the prospects for their practical application and continuation of work in the chosen field of chemistry, chemical technology or sciences related to chemistry. | PC-3. Ability to carry out pedagogical activity. | PC-4. Ability to provide organizational and methodological support for the educational process. |
| Block 1. | Disciplines (modules) | | | | |
| B1.O | Mandatory part | | | | |
| B1.O.01 | Core component | | | | |
| B1.O.01.01 | Actual problems of modern chemistry | | | | |
| B1.O.01.02 | Higher education pedagogy | | | PC-3.1; PC-3.2; PC-3.3 | PC-4.1; PC-4.2 |
| B1.O.01.03 | Psychology of management | | | PC-3.1; PC-3.2 | |
| B1.O.01.04 | History and philosophy of science | | | | |
| B1.O.01. DV.01 | Foreign/Russian language in professional activity | | | | |
| B1.O.02 | Variable component | | | | |
| B1.O.02.01 | Bioenergy | | PC -2-1 | | |
| B1.O.02.02 | Modern organic synthesis and pharmacology | PC -1.1, PC -1.2 | | | |
| B1.O.02.03 | Alternative/new tools for organic synthesis | PC -1.1, PC -1.2 | . | | |
| B1.O.02.04 | Bioproducts, Biomaterials and Biorefineries | | PC -2.1, PC -2.2 | | |
| B1.O.02.05 | Advanced Organic Synthesis | PC -1.1 | | | |
| B1.O.02.06 | Catalyst (nanomaterials) design and applications | PC -1.1 | PC -2.1 | | |
| B1.O.02.07 | Catalysis: from Basic principles to applications. Homogeneous, Heterogeneous, PhotoCatalysis, Biocatalysis, Electrocatalysis | | | | |
| B1.O.02.08 | Experimental lab 1: Flow synthesis and alternative technologies | PC -1.1, PC -1.2 | PC -2.2 | | |
| B1.O.02.09 | Experimental lab 2: Biorefineries and Bioproducts | PC -1.1, PC -1.2 | | | |
| B1.O.02.10 | Experimental lab 3: Advanced Organic Synthesis | PC -1.1, PC -1.2 | PC -2.2 | | |
| B1.O.02.11 | Artificial intelligence and additive technologies in chemistry | | PC -2.2 | | |
| <i>B1.O.V.01</i> | <i>Elective disciplines</i> | | | | |
| B1.O.V.01.01 | Emerging contaminants: from fate to environmental remediation | PC -1.1, PC -1.2 | | | |

| Code | Courses/modules that form students' competences | PROFESSIONAL COMPETENCES | | | |
|-----------------|--|--|--|--|---|
| | | PC-1. Ability to develop a work plan and to choose adequate methods for solving research problems in the chosen field of chemistry, chemical technology or sciences related to chemistry | PC-2. Ability, based on a critical analysis of the results of research and development, to evaluate the prospects for their practical application and continuation of work in the chosen field of chemistry, chemical technology or sciences related to chemistry. | PC-3. Ability to carry out pedagogical activity. | PC-4. Ability to provide organizational and methodological support for the educational process. |
| B1.O.V.01.02 | The method of working with databases | PC -1.1, PC -1.2 | | | |
| B2 | Internship | | | | |
| B2.O.01.01(S) | Student Scientific- Research work | PC -1.1, PC -1.2 | PC -2-1, PC -2.2 | | |
| B2.O.01.02 (Ed) | Teaching practice | | | PC -3.1, PC -3.2; PC-3.3 | PC -4.1, PC -4.2 |
| B2.O.01.03(Pg) | Pre-graduation practical training | PC -1.1, PC -1.2 | PC -2-1, PC -2.2 | | |
| B3 | Final State Examination | | | | |
| B3.01 | Writing, preparation for the graduate qualification work defense and graduate qualification work defense | PC -1.1, PC -1.2 | PC -2-1, PC -2.2 | PC -3.1, PC -3.2 | PC -4.1, PC -4.2 |