

Abstract
of Bachelor's Degree Program
in Field of Education 04.03.01 Chemistry,
Discipline (Specialization) "Synthesis and Analysis of Organic Compounds"
(Internal Study Mode)

Terms, Workload of the Degree Program and Qualification of Graduates

Name	Qualification	Term of education including the holidays provided after the completion of the State Final Certification	Workload (in credits)
Bachelor's degree program	Bachelor	4 years	240

Purpose (Mission) of the Degree Program

The mission of the bachelor's degree program in "Synthesis and Analysis of Organic Compounds" is training of qualified professionals in the field of analysis of biologically active substances including medicinal products who are able to ensure quality control at professional level in the field of pharmaceutical manufacturing of medicinal products as well as in the field of the development of new biologically active substances.

The degree program is aimed at the implementation of the following principles namely: application of the education results in professional practices, professional activities based on the continuous development of new chemical analysis technologies, independent carrying out of tasks related to the quality control of biologically active substances including medicinal products, aggregation and interpretation of analysis results;

Demand for Graduates

Graduates of the bachelor's degree program in "Synthesis and Analysis of Organic Compounds" are in demand with quality control departments of pharmaceutical enterprises, test laboratories in the system of state registration and certification of medicinal products, scientific laboratories of preclinical studies, laboratories of analysis of biologically active supplements, cosmetics, foodstuffs and other analytic laboratories carrying out chemical analysis.

Requirements for Enrollment in the Degree Program

The persons with at least general secondary education who have passed entrance examinations in accordance with the Regulations for Admission to Higher Education Programs, namely bachelor's degree programs, specialist's and master's degree programs, are allowed for enrollment.

Graduate's Qualification Characteristic
Areas of Professional Activity

The area of professional activity of graduates who have completed the bachelor's degree program includes scientific research work related to the use of chemical phenomena and processes; the field of engineering and manufacturing as well as the field of organization and management.

According to the register of professional standards (the list of types of professional activity approved by Order No. 667n of the Ministry of Labor of Russia dated 29.09.2014) the areas of professional activity and fields of professional activity which the graduates who have completed the bachelor's degree program (hereinafter referred to as graduates) can be engaged in include:

02 Healthcare (in the field of the development of new medicinal products, in the field of quality control of raw materials and finished products of the pharmaceutical industry, in the field of chemico-toxicological studies);

40 Cross-cutting types of professional activity in industry (in the field of research and technological development and introduction of products of different purpose, in the field of metrology, certification and quality control of products).

Graduates can be engaged in professional activity in other areas and (or) fields of professional activity if their education level and acquired competences correspond to the employee's qualification.

Objects of Professional Activity

In accordance with the types of professional activity, the objects of professional activity of graduates in degree program 04.03.01 Chemistry, discipline "Synthesis and Analysis of Organic Compounds" are:

– Chemical elements, simple molecules and complex compounds in different aggregate states (inorganic and organic substances and materials on their basis) obtained in the result of chemical synthesis (laboratory, industry synthesis) or obtained from the natural objects.

- Chemical elements, substances, materials, raw materials resources, chemical processes and phenomena.

Types of Professional Activity

Types of professional activity which the graduates who have completed the bachelor's degree program are prepared for:

- scientific research;
- engineering

Tasks of Professional Activity

The graduate who has completed the bachelor's degree program is ready to carry out the following job tasks:

Scientific Research Activity:

- conduct of scientific research, carrying out of experiments and tests;
- arrangement and planning of works for pharmaceutical development;
- carrying out of works for pharmaceutical development;

Technological Activity:

- carrying out of works for quality control of pharmaceutical manufacturing;
- control of the engineering process in industrial manufacturing of medicinal products.

List of Professional Standards Corresponding to the Professional Activity of Graduates Who Have Completed the Degree Program

Item No.	Code of professional standard	Name of professional standard
02 Healthcare		
1	02.010	Specialist in industrial pharmacy in the field of research of medicinal products
2	02.013	Specialist in industrial pharmacy in the field of quality control of medicinal products
3	02.016	Specialist in industrial pharmacy in the field of production of medicinal products
40 Cross-cutting types of professional activity in industry		
3	40.011	Specialist in research and technological development

General Characteristic of the Degree Program

Planned results of completing of the degree program (competences) and indicators of their achievement

In accordance with the aims of the degree program and types of tasks of professional activity, graduate of the bachelor's degree program "Synthesis and Analysis of Organic Compounds" shall have the following competences characterized by the indicators of their achievement:

Code and name of UC	Code and name of indicator of the graduate's UC
UC-1. Able to search, critically analyze and synthesize information, use the system approach for carrying out the set tasks	UC-1.1 Analyzes the task, emphasizing its basic components
	UC-1.2 Determines, interprets and ranks the information required for carrying out the set task

	<p>UC-1.3 Searches information for carrying out the set task for different types of queries</p> <p>UC-1.4 During the information processing, distinguishes facts from opinions, interpretations, assessments, forms their own opinions and judgments, gives the reasons for their conclusions and point of view also using a philosophical conceptual framework</p> <p>UC-1.5 Considers and suggests possible variants of solutions to the set tasks assessing their advantages and disadvantages</p>
<p>UC-2. Able to determine the range of tasks within the set goal and choose the most appropriate ways of solving them in accordance with the current law, available resources and limits</p>	<p>UC-2.1. Determines the range of tasks within the set goal, determines links between them</p> <p>UC-2.2. Suggests ways of solving the set tasks and the expected results; assesses the suggested ways in terms of corresponding to the project goal</p> <p>UC-2.3. Plans the implementation of tasks in their area of responsibility given the available resources and limits, in accordance with the current law</p> <p>UC-2.4. Carries out the tasks in their area of responsibility in accordance with the planned results and control points, corrects the ways of tasks solving if necessary</p>
<p>UC-3. Able to be involved in social interaction and play their role in the team</p>	<p>UC-3.1. Determines their role in social interaction and teamwork based on the strategy of cooperation for achieving the set goal</p> <p>UC-3.2. When playing their role in social interaction and teamwork, takes into account the particularities of behavior and interests of other team members of the laboratory at the pharmaceutical enterprise</p> <p>UC-3.3. Analyzes possible consequences of personal actions in social interaction and teamwork and taking this into account makes productive interaction in the team of the laboratory at the pharmaceutical enterprise</p> <p>UC-3.4. Exchanges information, knowledge and experience with team members; assesses ideas of other team members for achieving the set goal</p> <p>UC-3.5. Complies with the standards and established rules of teamwork; takes personal responsibility for the result</p>
<p>UC-4. Able to communicate for business in oral and written form using the official language of the Russian Federation and foreign language(s)</p>	<p>UC-4.1. Chooses the style of communicating in Russian language depending on the goal and conditions of partnership; adapts speech, communication style and body language to the situations of interaction</p> <p>UC-4.2. Maintains business correspondence in Russian, given the stylistics features of formal and informal letters</p>

	UC-4.3. Maintains business correspondence in a foreign language, given the stylistics features of formal letters and social and cultural differences
	UC-4.4. Translates official and professional texts from a foreign language into Russian and from Russian into a foreign language for personal advantage
	UC-4.5. Makes a public appearance with a speech in Russian, builds their speech so as to meet the audience and the purpose of communication
	UC-4.6. Orally presents the results of their activities in a foreign language, can support the conversation during the discussion of the results
UC-5. Able to perceive the intercultural diversity of the society in socio-historical, ethical, and philosophical contexts	UC-5.1. Distinguishes and analyzes the peculiarities of inter-cultural collaboration (advantages and possible problem situations) arising due to differences in ethical, religious and value systems
	UC-5.2. Suggests ways to overcome communication barriers in inter-cultural collaboration within the laboratory team of a pharmaceutical enterprise
	UC-5.3. Defines the conditions for the integration of inter-cultural collaboration participants for achievement of the set goal, proceeding from legacy and social and cultural traditions of different social groups, ethnicities and religious denominations
UC-6. Able to manage their time, build and implement a self-development path based on the lifelong learning principles	UC-6.1. Uses time management tools and techniques when performing specific tasks, implementing specific projects, and achieving set goals
	UC-6.2. Sets the priorities of their activities, personal development and professional growth
	UC-6.3. Evaluates the labor market requirements and the educational service offering to build a professional growth path of their own
	UC-6.4. Builds a professional career ladder and establishes a professional development strategy
UC-7. Able to maintain an adequate level of physical fitness to ensure full-fledged social and professional activities	UC-7.1. Chooses health-saving technologies to ensure wellness management, given the physiological make-up and the conditions for implementation of professional activities
	UC-7.2. Schedules their work and free time for an optimal combination of physical load and mental burden as well as performance assurance
	UC-7.3. Follows and promotes healthy lifestyle standards in various life situations and professional activities

UC-8. Able to create and maintain safe standards of living in everyday life and professional activities to preserve the natural environment, ensure the sustainable development of the society, including in case of threat or occurrence of emergencies and military conflicts	UC-8.1. Analyzes factors of harmful effect of parts of the environment (facilities, engineering processes, materials, buildings and structures, natural and social phenomena)
	UC-8.2. Identifies hazardous and harmful factors within the activity undertaken
	UC-8.3. Identifies problems related to safety violations at the workplace; suggests actions to prevent emergencies
	UC-8.4. Explains the rules of conduct in case of natural and man-made emergencies; administers first aid, describes the ways of being engaged in rehabilitation measures
UC-9. Able to make reasoned economic decisions in various areas of life	UC-9.1 Makes decisions on personal financial management based on knowledge of basic categories and concepts of market economy, regularities of behavior of different economic entities, including in the pharmaceutical market in the context of limited resources
	UC-9.2. Participates in the implementation of economic activities of the unit, considering the theoretical basis of business activities based on knowledge of economic patterns and relations
UC-10. Able to form an intolerant attitude towards corrupt conduct	UC-10.1. Understands the meaning of basic legal categories, the essence of corrupt conduct, forms of its manifestation in various fields of public life, including quality control of pharmaceutical products
	UC-10.2. Identifies and assesses risks of corruption, shows intolerant attitude towards corrupt conduct in the field of quality control of pharmaceutical products
	UC-10.3. Knows how to correctly analyze, interpret and apply the rules of law in various fields of social activities, as well as in anti-corruption management. Undertakes social and professional activities based on a developed legal consciousness and formed legal culture
GPC-1. Able to analyze and interpret the results of chemical experiments, observations and measurements	GPC-1.1. Systematizes and analyzes the results of chemical experiments, observations, measurements, as well as the results of calculations of substance and material properties
	GPC-1.2. Suggests an interpretation of the results of their own experiments and theoretical computation work with the use of theoretical basics of conventional and new branches of chemistry
GPC-2. Able to run chemical experiments subject to safety regulations, including synthesis, analysis, determination of structure and investigation of properties of substances and materials, study of processes involving them	GPC-2.1 Works with chemical substances subject to safety regulations
	GPC-2.2 Performs synthesis of substances and materials of different nature using available techniques

	GPC-2.3 Performs standard operations to determine the chemical and phase composition of substances and materials based on them
	GPC-2.4 Performs the study of properties of substances and materials with the use of commercial scientific equipment
GPC-3. Able to apply theoretical and computation methods to investigate the properties of substances and processes involving them with the use of state-of-the-art computing technologies	GPC-3.1. Applies theoretical and semiempirical models in solving chemistry-oriented problems
	GPC-3.2. Uses standard software in solving chemistry-oriented problems
GPC-4. Able to plan chemistry-oriented activities, handle and interpret the obtained results using theoretical knowledge and practical skills in solving mathematical and physical problems	GPC-4.1. Uses basic knowledge of mathematics and physics in planning chemistry-oriented activities
	GPC-4.2. Handles data using common techniques of numerical characteristics approximation
	GPC-4.3. Interprets the results of chemical observations using principles and concepts of physics
GPC-5. Able to understand the operating principles of state-of-the-art IT solutions and apply them in solving tasks of professional activity	GPC-5.1. Applies basic knowledge of the underlying principles, methods, and properties of IT solutions when selecting software for solving job tasks
	GPC-5.2. Assesses IT solutions and software used in solving job tasks in terms of obsolescence and selects today's software
GPC-6. Able to present the results of their work in oral and written form according to the rules and regulations established in the professional community	GPC-6.1. Presents work results in the form of a standard report
	GPC-6.2. Presents information with chemical content subject to the bibliographic requirements
	GPC-6.3. Presents work results in the form of an abstract and presentation according to the rules and regulations established in the chemical community
PC-1. Able to run experiments using state-of-the-art equipment and formalizes research and development results	PC-1.1. Uses state-of-the-art equipment in conducting scientific research with the use of physical and chemical methods of analysis, including analysis of biologically active substances to determine their structure/constitution/properties
	PC-1.2. Uses state-of-the-art equipment in conducting scientific research with the use of standard techniques of analysis
	PC-1.3. Collects, handles, analyzes and summarizes best domestic and international practices in the relevant area of research
	PC-1.4. Performs observations and measurements, describes them and formulates conclusions

	PC-1.5. Formalizes research and development results
PC-2. Able to make organizational and managerial decisions in the field of research, testing and experimentation in pharmaceutical development	PC-2.1. Plans and manages the work of a small team to solve specific narrow-focus engineering and manufacturing and research problems
	PC-2.2. Systematizes and summarizes information on the productive resources of the structural unit and assesses the effectiveness of their use based on such information
PC-3. Able to plan and perform streamlined synthesis of organic compounds with useful properties under the guidance of a specialist of higher qualification	PC-3.1. Plans synthesis of organic compounds, given the chemical properties of functional groups and those of the molecule as a whole
	PC-3.2. Selects sound conditions for organic synthesis of biologically active substances
	PC-3.3 Able to perform streamlined synthesis of organic compounds with a given set of properties in the context of the set task
	PC-3.4 Performs material calculations when carrying out organic synthesis of biologically active substances
PC-4. Able to perform quality control of medicinal products, starting materials, intermediate products, carry out certification of products	PC-4.1. Performs the required operations (manipulations) for the preparation of laboratory equipment, materials and objects, prepares solutions for testing medicinal products, starting materials, intermediate products as per the established procedures
	PC-4.2. Performs the required operations on high-technology equipment in compliance with the established requirements
	PC-4.3. Records, handles and interprets the results of tests performed on medicinal products, starting materials, intermediate products, as well as draws up test records, chemical safety data sheets, reports on work done according to a given form
PC-5. Has skills of calculating the main engineering performance of the process of manufacturing pharmaceutical products	PC-5.1. Performs calculations of typical performance of chemical technology processes of manufacturing pharmaceutical products
	PC-5.2. Performs material calculations for individual stages of pharmaceutical manufacturing

Curriculum of Bachelor's Degree Program in "Synthesis and Analysis of Organic Compounds"

Mandatory part (name, workload, final discipline assessment)

1. History – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
2. History of Russia – 1 credit (36 hours), in-class work – 24 hours
3. World History – 2 credits (72 hours), in-class work – 24 hours, pass-fail test
4. Physical Training and Sports – 2 credits (72 hours), in-class work – 32 hours, pass-fail test
5. Introduction to a Profession – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
6. Mathematics – 12 credits (432 hours), in-class work – 174 hours, examination
7. Physics and Biophysics – 7 credits (252 hours), in-class work – 118 hours, examination, pass-fail test
8. General and Inorganic Chemistry – 12 credits (432 hours), in-class work – 184 hours, examination
9. Health and Wellness – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
10. Philosophy – 3 credits (108 hours), in-class work – 48 hours, pass-fail test

11. Statistical Methods of Analysis – 6 credits (216 hours), in-class work – 96 hours, examination
12. Analytical Chemistry – 15 credits (540 hours), in-class work – 234 hours, examination
13. Physical Chemistry – 9 credits (324 hours), in-class work – 134 hours, examination, pass-fail test
14. Computational Methods in Chemistry – 3 credits (108 hours), in-class work – 40 hours, pass-fail test
15. Organic Chemistry – 16 credits (576 hours), in-class work – 234 hours, examination
16. Colloid Chemistry – 7 credits (252 hours), in-class work – 110 hours, examination
17. Chemical Analysis Metrology – 3 credits (108 hours), in-class work – 40 hours, graded test
18. Theoretical Basics of Chemical Processes – 6 credits (216 hours), in-class work – 80 hours, graded test
19. Foreign Language and Business Communication in Foreign Language – 12 credits (432 hours), in-class work – 208 hours, examination, pass-fail test
20. Foreign Language – 6 credits (216 hours), in-class work – 128 hours, pass-fail test
21. Business Communication in Foreign Language – 5 credits (180 hours), in-class work – 80 hours, pass-fail test
22. Examination in module “Foreign Language and Business Communication in Foreign Language” – 1 credit (36 hours), examination
23. Basics of Phytochemistry – 5 credits (180 hours), in-class work – 72 hours, graded test
24. Information Technology in Professional Activity – 3 credits (108 hours), in-class work – 42 hours, pass-fail test
25. Introduction to Pharmacopoeial Analysis – 9 credits (324 hours), in-class work – 144 hours, examination

The part formed by participants of educational relations (name, workload, final discipline assessment)

26. Economics – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
27. Culture of Spoken Russian – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
28. Biology – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
29. Business Communication – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
30. Culture Studies – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
31. Legal Studies – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
32. Conflict Resolution Studies – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
33. Basics of Project Management and Teambuilding – 3 credits (108 hours), in-class work – 48 hours, pass-fail test
34. Environment Protection – 3 credits (108 hours), in-class work – 46 hours, pass-fail test
35. Principles of Production of Finished Medicinal Products – 3 credits (108 hours), in-class work – 42 hours, pass-fail test
36. Basics of Chemical Synthesis of Pharmaceutical Substances – 6 credits (216 hours), in-class work – 90 hours, examination
37. Chemical Bases of Biological Processes – 6 credits (216 hours), in-class work – 90 hours, examination
38. Biopharmaceutical Products – 3 credits (108 hours), in-class work – 40 hours, pass-fail test
39. Methods of Organic Synthesis – 11 credits (396 hours), in-class work – 164 hours, examination, pass-fail test
40. Physical Methods of Study of Organic Compounds Structure – 9 credits (324 hours), in-class work – 142 hours, examination, pass-fail test, course work
41. Basics of Computer Modeling in Organic Chemistry – 3 credits (108 hours), in-class work – 42 hours, pass-fail test
42. Basics of Economics and Management of Chemical Analytical Laboratory – 3 credits (108 hours), in-class work – 48 hours, pass-fail test, course work

Elective disciplines in physical training and sports (name, workload, final discipline assessment)

43. Elective Physical Training and Sports: General Physical Preparedness – (328 hours), in-class work – 132 hours, pass-fail test
44. Elective Physical Training and Sports: Health-Improving Physical Activities – (328 hours), in-class work – 132 hours, pass-fail test

Elective disciplines (name, workload, final discipline assessment)

45. Chemistry of Synthetic Biologically Active Substances – 2 credits (72 hours), in-class work – 44 hours, pass-fail test
46. Identification of Functional Groups of Organic Compounds by IR Spectroscopy Method – 2 credits (72 hours), in-class work – 44 hours, pass-fail test
47. Electrochemical Methods of Analysis – 2 credits (72 hours), in-class work – 30 hours, pass-fail test
48. Sample Preparation in Chemical Analysis – 2 credits (72 hours), in-class work – 30 hours, pass-fail test
49. Current Methods of Purification of Organic Substances – 3 credits (108 hours), in-class work – 44 hours, pass-fail test
50. Catalysis in Organic Synthesis – 3 credits (108 hours), in-class work – 44 hours, pass-fail test
51. Good Laboratory Practice – 2 credits (72 hours), in-class work – 30 hours, pass-fail test
52. Biochemical Methods – 2 credits (72 hours), in-class work – 30 hours, pass-fail test

Optional subjects (name, workload, final discipline assessment)

53. Time Management Basics – 2 credits (72 hours), in-class work – 32 hours, pass-fail test
54. Basics of Logic and Theory of Argumentation – 2 credits (72 hours), in-class work – 32 hours, pass-fail test

Practices (name, workload, final assessment)

55. Academic practical training: introduction into practice – 3 credits (108 hours), in-class work – 40 hours, pass-fail test
56. Scientific Research Work – 3 credits (108 hours), in-class work – 6 hours, graded test
57. Production Practice – 3 credits (108 hours), in-class work – 12 hours, graded test
58. Pre-graduation Practice – 6 credits (216 hours), in-class work – 18 hours, graded test

State final certification

59. Preparation for presentation and presentation of graduate qualification work – 6 credit (216 hours), examination

Resources Provision of the Degree Program

Bachelor's degree program "Synthesis and Analysis of Organic Compounds" is provided with learning and teaching documentation, as well as materials in all disciplines (modules) and practices, including electronic educational-methodical complexes posted in electronic information and educational environment of the University.

The University has facilities and resources that are in compliance with applicable fire safety rules and regulations and ensure all types of the disciplinary and interdisciplinary preparation, practical and scientific research works of students, provided for by the curriculum.

The list of facilities and resources, learning and teaching support, required for implementation of the degree program, includes the following: special rooms in the form of classrooms for conducting lecture-type activities, seminar-type activities, course work development (course work execution), group and individual tutorials, current control and midterm assessment. There are also rooms for independent work and rooms for storage and preventative maintenance of training equipment. Special rooms are equipped with designated furniture and teaching aids intended for presentation of teaching information to a large audience. Laboratories are equipped with laboratory equipment depending on the degree of complexity. Sets of demonstration equipment and illustrative study guides providing for topic-based illustrations and corresponding to discipline (module) programs, working educational programs of disciplines (modules), are offered for lecture-type activities.

Rooms for students' independent work are equipped with computer hardware with the possibility of connecting to the Internet network and access to electronic information and educational environment of the organization. Furthermore, students' independent work is arranged with the use of electronic resources of the University.

The library fund is provided with the required number of printed publications, moreover, there is an access to electronic library systems.

The University has the necessary licensed software package the composition of which is given in working programs of disciplines (modules) and is subject to annual update.

The students are provided with an access (remote access), including in the event of doing electronic learning, applying distance learning technology, to today's professional data bases and inquiry and communications systems the composition of which is determined in working programs of disciplines (modules) and is subject to annual update.

During the whole period of studying every student and a teacher are provided for with an unlimited access (including the remote one) to electronic library systems and to electronic information and educational environment of the University from any place with the available Internet connection.

Electronic information and educational environment of the University provides for:

- the access to curricula, working programs of disciplines (modules), practices, editions of electronic library systems and electronic learning resources specified in working programs;
- recording of progress of the educational process, results of midterm assessment and results of the degree program completion;
- the formation of electronic portfolio of the student, including the preservation of student's works and grades for these works by any participants of the educational process;
- interaction between participants of the educational process, as well as synchronous and (or) asynchronous communication via Internet.

Functioning of electronic information and educational environment complies with the requirements of the legislation of the Russian Federation in the field of education and is provided for with the relevant means of information and communication technologies and qualification of the University employees who use and maintain it.

Staffing of the Degree Program

Implementation of the bachelor's degree program is ensured by the University teaching staff, as well as by persons engaged in the implementation of the bachelor's degree program under the terms of the civil contract.

Qualification of the teaching staff meets the qualification requirements specified in qualification reference books and professional standards. At least 60 percent of the teaching staff who take part in the implementation of the bachelor's degree program and of persons engaged in the implementation of the bachelor's degree program carry out scientific, teaching and learning, and (or) practical work corresponding to the profile of disciplines (modules) being taught.

At least 5 percent of the University teaching staff, taking part in the implementation of the bachelor's degree program and of persons engaged in the implementation of the bachelor's degree program, are managers and (or) employees of other organizations who carry out labor activities in the professional sphere corresponding to the professional activities the graduates are prepared for and who have work experience in this professional sphere of at least 3 years.

At least 60 percent of the teaching staff of the University, and of persons engaged in the implementation of the bachelor's degree program, have an academic degree and (or) rank.

Uniqueness and Competitive Advantages of the Program

The degree program "Synthesis and Analysis of Organic Compounds" has a relevant focus. It is intended for preparing specialists in the field of the development and production of new biologically active substances based on the continuous development of new chemical synthesis and analysis. It takes into account current trends of the development of chemical and pharmaceutical science, relevant demand for specialists in the labor market of pharmaceutical industry.