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

FINAL STATE EXAMINATION SYLLABUS

Recommended by the Didactic Council for the Education Field of:

04.04.01 «Chemistry»

field of studies / speciality code and title

The final state examination is implemented within the professional education program of higher education:

«Bioenergies and Biorefineries»

higher education programme profile/specialisation title

2024

1. FINAL STATE EXAMINATION GOAL AND TASKS

The goal of the final state examination within the framework of the implementation of the higher education programme «Bioenergies and Biorefineries» is to check the conformity of the students' training outcomes as the programme results with the relevant requirements of the Federal State Educational Standard of the Higher Education or the RUDN University Educational Standards.

The tasks of the final state examination include the following:

- checking the quality of teaching a person basic humanitarian knowledge, natural science laws and phenomena necessary for professional activities of a graduate;
- identifying the level of theoretical and practical readiness of a graduate to perform professional tasks in compliance with the qualification obtained;
- establishing the degree of a person's desire for self-development, improving his or her qualifications and skills;
- exploring the formation of a graduate's sustainable motivation for professional activities in compliance with the types of tasks of professional activities provided for by the Federal State Educational Standard of the Higher Education or the RUDN University Educational Standards;
- assessing the level of graduates' ability to find organizational and managerial solutions in non-standard situations and evaluating graduates' readiness to bear responsibility for them;
- ensuring the integration of education and scientific and technical activities, increasing the efficiency of scientific and technological achievements use, reforming the scientific sphere and stimulating innovation;
- ensuring the quality of specialists' training in compliance with the requirements of the Federal State Educational Standards of Higher Education or the RUDN University Educational Standards.

2. REQUIREMENTS FOR HIGHER EDUCATION PROGRAMME COMPLETION AND LEARNING OUTCOMES

A student who does not have failed tests or exams and who has fully completed the curriculum or the individual curriculum of the higher education programme is allowed to take the final state examination.

On the higher education programme completion the graduate is expected to master the following **generic competences** (GC):

Code and descriptor of the 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.

Code and descriptor of the generic competences
GC-7 Ability to look for the necessary sources of information and data, perceive, analyse, 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.

- general professional competences (GPC):

Code and descriptor of the 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

- professional competences (PC):

Code and descriptor of the 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.

3. FINAL STATE EXAMINATION PROCEDURE

The final state examination can be conducted both in in-person format (students and the state examination committee are at RUDN University during the examination), and through the use of distance learning technologies available in the RUDN Electronic Information and Educational Environment.

The procedure for in-person or DLT-facilitated final state examination is regulated by the relevant local normative act of the RUDN University.

The final state examination within the framework of the higher education programme includes:

- defence of the graduation qualifying paper (degree thesis).

4. STATE EXAM PROCEDURE

The State Exam is not included in the Final State Examination Syllabus.

5. REQUIREMENTS FOR GRADUATION QUALIFYING PAPER (DEGREE THESIS) AND PROCEDURE FOR ITS DEFENCE

The degree thesis is a graduation qualifying paper that the student (several students in a team) prepare to demonstrate his/her/their level of competence and work readiness.

The list of degree theses themes offered to students for further work is approved by the order of the head of the educational division (faculty/institute/academy) that runs the higher education programme, the respective information is delivered to the students by the programme head no later than six months before the date of the final state examination start.

The students are allowed to suggest their own themes for the theses, under the set procedure.

The student who has passed the state exam is admitted to defend the graduation degree thesis.

The student (students) is/are allowed to defend his/ her/their thesis only if this fully completed degree paper is signed by the respective graduate (s), the supervisor, the consultant (if any), the heads of the educational department and educational division; the thesis is also subject to the external review procedure (mandatory for master's and specialist's programmes) and the plagiarism check (in the "Antiplagiarism" system). The review of the graduation qualifying paper supervisor shall be attached as well, with a specific emphasis laid on the graduate's activities in the course of the degree thesis drafting.

No later than 14 days before the date of the thesis defence, a rehearsal of the procedure is held in the presence of the degree thesis supervisor and other academic staff of the educational department, in order to timely identify and eliminate shortcomings in the structure, content and design of the degree thesis.

The degree theses are introduced to the State Examination Board members at the public defence procedure. It includes the students' oral reports with mandatory multimedia (graphic) presentations that introduce the thesis main content.

At the end of the reports, the students reply orally to the State Examination Board members' questions regarding the subject, structure, content of the paper and the profile/ specialisation of the higher education programme. The reports and / or answers to the Board members' questions may be delivered in a foreign language.

The stages of the graduation qualifying paper preparation, the requirements for its structure, volume, contents and design, as well as the list of mandatory and recommended documents submitted for defence are specified in the relevant guidelines.

The evaluation of the degree thesis defence results is carried out in accordance with the methodology set forth in the assessment toolkit that is specified in the Appendix to the syllabus.

6. REQUIREMENTS FOR EQUIPMENT AND TECHNOLOGY SUPPORT FOR FINAL STATE EXAMINATION

Classrooms equipped with computers, specialized software, multimedia projector, projector screen, wi-fi available, chalk board.

7. RECOMMENDED RESOURCES FOR FINAL STATE EXAMINATION

Main readings to prepare for the degree thesis defence:

1. Smith, M. B. (2020). March's advanced organic chemistry: reactions, mechanisms, and structure. John Wiley & Sons.
2. Jha, A. K. (2023). Solid-State Chemistry: A Modern Approach. CRC Press.

3. Uskoković, V. (2010). Major Challenges for the Modern Chemistry in Particular and Science in General. Foundations of Science, 15(4), 303–344. doi:10.1007/s10699-010-9185-8
4. Tietze, L. F. (1996). Domino reactions in organic synthesis. Chemical reviews, 96(1), 115-136.
5. John A. Joule, Keith Mills (2010) Heterocyclic Chemistry, 5th Edition, Wiley-Blackwell

Additional readings to prepare for the degree thesis defence:

1. Rothenberg, G. (2017). Catalysis: concepts and green applications. John Wiley & Sons.
2. Julian R.H. Ross, Contemporary Catalysis, Fundamentals and Current Applications, Elsevier, 2019
3. Kosak, J.R., & Johnson, T.A. (Eds.). (1993). Catalysis of Organic Reactions (1st ed.). CRC Press.
4. Vladislav Sadykov, Advanced Nanomaterials for Catalysis and Energy Synthesis, Characterization and Applications, Elsevier, 2018
5. Zhou, Bing, Sophie Hermans, and Gabor A. Somorjai, eds. Nanotechnology in Catalysis Volumes 1 and 2. Vol. 2. Springer Science & Business Media, 2003.
6. Glasnov, Toma. Continuous-flow chemistry in the research laboratory. Cham: Springer, 2016.
7. Butt, John. Activation, deactivation, and poisoning of catalysts. Elsevier, 2012.

Internet sources

1. Electronic libraries with access for RUDN students:
- RUDN Electronic Library System (RUDN ELS) http://lib.rudn.ru/MegaPro/Web
- EL "University Library Online" http://www.biblioclub.ru
- EL "Yurayt" http://www.biblio-online.ru
- EL "Student Consultant" www.studentlibrary.ru
- EL "Lan" http://e.lanbook.com/
- EL "Trinity Bridge"
- Scientific EL http://elibrary.ru/
-EL BOOKUP http://books-up.ru/

2. *Databases and search engines:*
- electronic foundation of legal and normative-technical documentation http://docs.cntd.ru/
- Yandex search engine https:// www .yandex.ru/
- Google search engine https://www.google.ru/
- Scopus abstract database http://www.elsevierscience.ru/products/scopus/
- AVS Publications Digital Library https://avs.scitation.org/
- The ECS Digital Library http://ecsdl.org/
- Library of the Faculty of Chemistry, Moscow State University: http://www.chem.msu.su/rus/library/welcome.html
- Journals of the American Chemical Society: www.pubs.acs.org

- Journals of the Royal Society of Chemistry http://pubs.rsc.org/en/journals/

The training toolkit and guidelines for student's self-studies to prepare for the state exam and /or to draft the degree thesis and defend it:*

1. The guidelines for drafting and formatting the degree thesis within the higher education programme «Bioenergies and Biorefineries»
2. The procedure for the degree thesis check in the "Anti- plagiarism" system.
3. The procedure for conducting the final state examination under the higher education programme «Bioenergies and Biorefineries» through the use of DLT and proctoring system.

*The training toolkit and guidelines for the student's self-studies are placed on the final state examination page in the university telecommunication training and information system under the set procedure.

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF GRADUATES' COMPETENCES LEVEL

The assessment materials and the grading system* to evaluate the graduate's level of competences (competences in part) formation as the results of the higher education programme completion are specified in the Appendix to this syllabus.

* The assessment materials and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

HEAD OF EDUCATIONAL DEPARTMENT:

Organic Chemistry Department		Voskressensky L.G.
educational department	signature	name and surname

HEAD OF HIGHER EDUCATION PROGRAMME:

Dean of Faculty of Science Head of Organic Chemistry Department		Voskressensky L. G.
position, department	signature	name and surname