

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION  
 Federal State Autonomous Educational Institution of  
 Higher Education  
 "Ural Federal University named after the First President of Russia B.N. Yeltsin"  
 Institute of Natural Sciences and Mathematics

APPROVED BY  
 Vice-Rector for Research

A.V. Germanenko  
 2023



**PROGRAM OF THE DISCIPLINE**

Research practice

List of information about the program of the discipline	Credentials
<b>Postgraduate Program</b> Solid State Chemistry	<b>Code PP</b> 1.4.15.
<b>Group of specialties</b> Chemical Sciences	<b>Code</b> 1.5.
<b>Federal State requirements (FSR)</b>	Order of the Ministry of Science and Higher Education of the Russian Federation № 951 dated 20.10.2021.
<b>Self-approved requirements (SAR)</b>	Order "On the implementation of the "Requirements for the development and implementation of training programs for scientific and scientific-pedagogical personnel in the graduate school of UrFU" dated 31.03.2022 №315/03

Yekaterinburg  
 2023

The program of the research practice was compiled by the authors:

<b>№</b>	<b>Name</b>	<b>Degree, Academic Title</b>	<b>Position</b>	<b>Affiliation</b>
1	Cherepanov Vladimir Alexandrovich	Dr. Sci., Professor	Head of the Department.	Department of Physical and Inorganic Chemistry, Ural Federal University
2	Zuev Andrey Yurievich	Dr. Sci., Professor	Professor	Department of Physical and Inorganic Chemistry, Ural Federal University
3	Animitsa Irina Evgenievna	Dr. Sci., Assistant Professor	Professor	Department of Physical and Inorganic Chemistry, Ural Federal University

**Recommended by:**

**Educational and methodological board of Institute of Natural Sciences and Mathematics**

Head of the Educational and Methodological board of  
the Institute of Natural Sciences and Mathematics  
Record № 1 от 19.01.2023 г.



E. S. Buyanova

**Agreed by:**

Head of academic staff training department



E.A. Butrina

## **1. GENERAL CHARACTERISTICS OF THE DISCIPLINE RESEARCH PRACTICE**

### **1.1. Annotation of the content of the discipline**

The purpose of the discipline: the consolidation and deepening of postgraduate students' theoretical knowledge obtained in the study of disciplines, as well as the acquisition of research skills. The content of the research practice of a postgraduate student is determined taking into account the interests and capabilities of the department where it is carried out, and is completely determined by an individual task. The list of questions that graduate students study and perform in practice, their detail and depth of study, as well as the nature of individual tasks are determined by the head of the practice. The main objectives of the research practice are:

- development of practical skills and abilities of scientific activity;
- strengthening motivation for scientific work;
- mastering the methodology of research in the field of biotechnology;
- formation of the skills necessary for a scientific worker to successfully perform his/her functions;
- formation of skills for creative solution of scientific and research and production problems.

**1.2.** The language of the discipline implementation is English.

### **1.3. Planned learning outcomes by discipline**

As a result of mastering the discipline, a graduate student should:

#### **Know:**

- information on the organization of scientific work in a higher educational institution,
- a holistic view of scientific activity, research teams and the structure of the scientific community in higher education;
- the main achievements and trends in the development of the relevant subject and scientific area and its relationship with other sciences;
- the main scientific journals of the relevant subject and scientific field;
- legal and regulatory framework for the functioning of scientific activities;
- the procedure for implementing the main provisions and requirements of documents regulating the activities of the university, department, teaching staff to improve scientific work on the basis of the Federal State Educational Standards;
- real problems and tasks solved by research teams of institutions of higher professional education;

#### **Be able to:**

- use scientific technologies, methods and techniques for conducting scientific research;
- work on equipment and instruments used for scientific research;
- to apply modern information technologies in scientific activity;
- compare the results of their own research with the data of other researchers;
- use the skills of their own scientific research and research materials to improve educational activities;
- analyze the reasons for successes and failures in scientific activities, adjust their scientific activities;

#### **Own:**

- methods of using technical means in conducting scientific research;
- methods of oral and written scientific speech;
- skills of registration of results of scientific researches;
- methodology and technology of scientific research and scientific experiment;
- methodology for self-assessment and self-analysis of the results and effectiveness of scientific research.

#### 1.4. Practice base

The base of the research practice is FSAEI HE “Ural Federal University named after the first President of Russia B.N. Yeltsin. The organizer of the research practice is the department of the Institute of Natural Sciences and Mathematics or the Institute of Chemical Technology, to which the postgraduate student is assigned. If necessary, a graduate student can undergo research practice at other departments similar in terms of scientific work, especially if the scientific interests of the department and the topics of the research work of the graduate student coincide. During the period of practice, the postgraduate student obeys all internal regulations, observes the requirements of labor protection and safety regulations established at the university. General management of scientific practice and scientific and methodological consulting is carried out by the supervisor and/or head of practice.

#### 1.5. The structure of practices, their terms and duration

№	Type of practice	Academic semester number	Scope of Practice	
			weeks	credit unit
1.	Research practice	2	2	3
Total			2	3

#### 1.6. Scope of Practice

№	Types of educational work	Scope of discipline		Distribution of the volume of discipline in the 2nd semester (hours)
		Total hours	Incl. contact work (hour)*	
1.	<b>Independent work of graduate students, including all types of current attestation</b>	<b>108</b>		<b>108</b>
2.	<b>intermediate attestation</b>	Test	<b>0.25</b>	<b>Test, 4</b>
3.	<b>Total volume according to the curriculum, hour.</b>	108		108
4.	<b>Total volume according to the curriculum, credits</b>	3		3

## 2. CONTENT OF THE DISCIPLINE

The code section, topic	Section, topic of disciplines	Content
S1	Organizational aspects of scientific activity	Organization of scientific activity in the education system of the Russian Federation and UrFU. Legal and normative bases of scientific activity. Directions of scientific activity of the graduating department, leading professors and associate professors of the INSMA departments: history and current state. Scientific schools of UrFU in the field of solid state chemistry and related fields of science. Drawing up an individual plan for research practice.
S2	Oral and written scientific speech	The specifics of oral speech at scientific seminars, conferences, etc. The specifics of written scientific speech in the preparation of reports, articles, abstracts, presentations, monographs, popular science texts, etc.
S3	Practical aspects of scientific work	Participation in scientific seminars and other scientific meetings. Mastering the methods and techniques of working on scientific equipment in accordance with the scientific direction of the postgraduate student.

		Methods for assessing the quality of scientific activity and scientific publications. Development of a research plan, selection of adequate methods and research methods on the topic of dissertation work. Preparing for an internship report.
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### 3. ORGANIZATION OF PRACTICAL STUDIES, INDEPENDENT WORK ON THE DISCIPLINE

#### 3.1. Sample plan for self-study

List of tasks for independent work	Labor intensity	
	hour	credits
Organization of scientific activity in the Russian Federation, including in universities. Organization of scientific research in UrFU.	2	
Directions of scientific activity of the university in the field of solid state chemistry: history and current state. UrFU Scientific Schools in the field of Chemical Sciences, solid state chemistry and related fields of science.	2	
Drawing up an individual plan for research practice	2	
Preparation of oral presentations, reports, presentations for scientific seminars, conferences, etc.	12	
Preparation of scientific reports, articles, abstracts of reports, popular science texts, etc.	12	
Participation in scientific seminars, conferences and other scientific meetings	12	
Organizing and holding scientific meetings online using various services	8	
Studying the legal and regulatory framework for scientific activity	2	
Development of a research plan, selection of adequate methods and methods of research on the topic of dissertation work.	4	
Mastering the methods and techniques of working on scientific equipment in accordance with the scientific direction of the postgraduate student.	30	
Performing research in accordance with the practice program	20	
Preparing for an internship report	2	
<b>Total</b>	<b>108</b>	<b>3</b>

### 4. FUND OF EVALUATION FACILITIES FOR CURRENT AND INTERIM CERTIFICATION ON THE DISCIPLINE (Appendix 1)

#### 4.1. Criteria for evaluating the results of control and evaluation activities of the current and intermediate certification in the discipline

Approved by the Institute criteria for evaluating the achievements of graduate students for each control and evaluation event. The system of assessment criteria is based on three levels of development of competency components: threshold, advanced, high.

Competency components	Signs of the level of mastering the components of competencies		
	threshold	advanced	high
<b>Knowledge</b>	A graduate student demonstrates knowledge-acquaintance, knowledge-copy: he recognizes objects,	A graduate student demonstrates analytical knowledge: he confidently reproduces and under-	A graduate student can independently extract new knowledge from the world around him, crea-

	phenomena and concepts, finds differences in them, shows knowledge of the sources of obtaining information, can independently carry out reproductive actions on knowledge by self-worthy reproduction and application of information.	stands the acquired knowledge, assigns it to one or another classification group, independently systematizes it, establishes relationships between them, and applies it productively in familiar situations.	tively use it to make decisions in new and non-standard situations.
<b>Skills</b>	A graduate student is able to correctly perform prescribed actions according to an instruction, an algorithm in a known situation, independently performs actions to solve typical problems that require a choice from among known methods, in a predictably changing situation	A graduate student is able to independently perform actions (techniques, operations) to solve non-standard tasks that require a choice based on a combination of known methods in an unpredictably changing situation	A graduate student is able to independently perform actions related to solving research problems, demonstrates the creative use of skills (technologies)
<b>Personal qualities</b>	A graduate student has a low motivation for learning activities, shows an indifferent, irresponsible attitude to learning, assigned work	A graduate student has a pronounced motivation for learning activities, demonstrates a positive attitude towards learning and future work, and is active.	The graduate student has a developed motivation for learning and work activities, shows perseverance and dedication, diligence, independence, and creativity.

#### 4.2. Evaluation tools for current and intermediate certification

The final document is a written report of the postgraduate student, which should reflect the sections in accordance with the practice program and the presentation of the results of the practice at a meeting of the department in the form of a report. In the report, the graduate student must reflect the results of the research. Attestation of a graduate student based on the results of practice is carried out by the department where he underwent research practice, based on the provision of a review by the head. A graduate student who has not completed the internship program, or who has received an unsatisfactory grade during the defense of the report, is sent to practice again during the holidays.

### 5. EDUCATIONAL AND INFORMATION SUPPORT OF DISCIPLINES

#### 5.1. Recommended literature

##### 5.1.1. Main literature

1. Dunleavy, P. *Authoring a PhD: How to Plan, Draft, Write and Finish a Doctoral Thesis or Dissertation*. Red Globe Press: 2003; p 297.
2. Tamhane, A. C. *Statistical Analysis of Designed Experiments: Theory and Applications*. 1 ed.; Wiley- Interscience: 2009; p 720.

##### 5.1.2. Additional literature

1. Booth, W. C.; Colomb, G. G.; Williams, J. M.; Bizup, J.; Fitzgerald, W. T. *The Craft of Research*. 4 ed.; University of Chicago Press: 2016; p 336.
2. Thomas, G. *How to Do Your Research Project: A Guide for Students*. 4 ed.; SAGE Publications Ltd: 2022; p 368.
3. Silvia, P. J. *How to Write a Lot: A Practical Guide to Productive Academic Writing*. 2 ed.; American Psychological Association: 2018; p 110.
4. Bright Wilson Jr., E. *An Introduction to Scientific Research*. Dover Publications: 1991; p 400.

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6. Schimel, J. Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded. Oxford University Press: 2011; p 221.
7. McCarthy, P.; Hatcher, C. Presentation Skills: The Essential Guide for Students (Study Skills). 1 ed.; SAGE Publications Ltd: 2002; p 228.
8. Morgan, S.; Whitener, B. Speaking about Science: A Manual for Creating Clear Presentations led.; Cambridge University Press: 2006; p 138.

## **5.2. Methodological developments**

Not provided

## **5.3. Software**

1. Microsoft office (Word, Excel, Power point);
2. Adobe Reader.
3. Scientific Research Software Package MATCAD.
4. CorelDraw X5
5. Chem office 2010 (ChemDraw, Chem3D)
6. Blast
7. Clustal

## **5.4. Databases, information and reference and search systems**

1. ScienceDirect: <http://www.sciencedirect.com>;
2. Web of Science: <http://apps.webofknowledge.com>;
3. Scopus: <http://www.scopus.com>;
4. Reaxys: <http://reaxys.com>;
5. Search engine EBSCO Discovery Service <http://lib.urfu.ru/course/view.php?id=141>;
6. Intelligent search engine Nigma RF (Нигма.РФ). access mode: <http://www.nigma.ru>.
7. [www.ncbi](http://www.ncbi)
8. [GenBank](http://www.ncbi)
9. PubMed

## **5.5. Electronic educational resources**

1. Zonal Science Library <http://lib.urfu.ru>;
2. Library catalogs <http://lib.urfu.ru/course/view.php?id=76>;
3. Digital catalogue <http://opac.urfu.ru>;
4. Electronic library systems <http://lib.urfu.ru/mod/resource/view.php?id=2330>;
5. Electronic resources of free access <http://lib.urfu.ru/course/view.php?id=75>;
6. Electronic resources by subscription <http://lib.urfu.ru/mod/data/view.php?id=1379>.

## **6. MATERIAL AND TECHNICAL SUPPORT OF THE DISCIPLINE**

### **6.1. Information about the equipment of the discipline with specialized and laboratory equipment**

Ural Federal University has special rooms for lecture-type classes, group and individual consultations, current control and intermediate certification, as well as rooms for independent work, equipped with computer equipment with the ability to connect to the Internet and provide access to the electronic information and educational environment and facilities for storage and preventive maintenance of equipment. Postgraduate students of the departments are provided with special rooms for research work.