

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

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«Perm State University»

Department of Biogeocenology and Nature Protection

PROGRAM  
STATE FINAL ATTESTATION

Direction of training  
05.03.06 Ecology and nature management

Preparation profile  
Ecological Engineering and New Energetics

Qualification (degree) of the graduate  
Bachelor

Form of study  
Full-time

Perm, 2021

The program of the state final attestation was drawn up on the basis of the independently established educational standard of higher education of PSU (hereinafter referred to as the EMS) in the direction of preparation 03.05.06 Ecology and nature management

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## 1. GENERAL PROVISIONS

State final attestation (SFA) is a form of assessing the degree and level of mastering by students of the educational program of higher education, which is carried out on the basis of the principles of objectivity and independence of assessing the quality of training of students.

In accordance with the Federal Law of December 29, 2012 No. 273-FZ (with amendments that came into force on September 1, 2013) "On Education in the Russian Federation", the final attestation completing the development of educational programs (hereinafter - EP) is mandatory and carried out in the manner and in the form established by the educational organization. Regulations on the procedure for conducting state final attestation for educational programs of higher education - bachelor's programs, specialist programs and master's programs at PSU (hereinafter, the Regulation on the procedure for SFA PSU).

A student who does not have academic debt and who has fully completed the curriculum or individual curriculum is admitted to the state final certification.

Students who have successfully passed the SFA are issued a document on education and qualifications of the sample established by the Ministry of Education and Science of the Russian Federation.

Students who have not passed the SIA or received unsatisfactory results at the SIA have the right to pass the SIA within the timeframes determined by the procedure for conducting the SIA according to the relevant EP.

Representatives of employers or their associations are involved in conducting the SFA for EP.

### **Documents on the basis of which the SFA Program was developed**

1. Federal Law of December 29, 2012 No. 273-FZ (with amendments that came into force on September 1, 2013) "On Education in the Russian Federation".

2. Independently established educational standard of higher education of PSNIU (hereinafter referred to as the EMS) in the direction of preparation 03.05.06 Ecology and nature management (approved by the decision of the PSU Academic Council on 04.28.2021, Protocol №. 8).

3. The procedure for organizing and carrying out educational activities for educational programs of higher education - bachelor's programs, specialty programs, master's programs, approved by order of the Ministry of Education and Science of April 5, 2017 No. 301.

4. The procedure for conducting state final certification for educational higher education - bachelor's programs, specialist programs and master's program, approved by order of the Ministry of Education and Science of the Russian Federation dated June 29, 2015 No. 636.

5. Regulations on the procedure for conducting state final certification for educational programs of higher education - bachelor's programs, specialist programs and master's programs at PSU dated 06/27/2018.

6. Educational program of higher education in the direction of preparation 03/05/06 Ecology and nature management (bachelor's level).

7. Curriculum in the direction of preparation 03/05/06 Ecology and nature management (bachelor's level).

8. Structure of the State Final Attestation Program in the direction of training 05.03.06 Ecology and nature management (bachelor's level) full-time and part-time education of the Siberian State University of Geosystems and Technologies, Department of Ecology and Nature Management. Novosibirsk, 2018.

## 2. OBJECTIVES OF THE STATE SUMMARY CERTIFICATION

SFA is carried out by state examination commissions (hereinafter referred to as the SEC) in order to determine the compliance of the results of mastering the EP with the requirements of the independent established educational standard (hereinafter referred to as the EMS) in the direction of training 03/05/06

The tasks of the SFA are:

- assessment of the degree and level of mastering by students of the main educational program of higher education in the direction of training 05.03.06 Ecology and nature management, profile " Ecological Engineering and New Energetics";
- making a decision on the assignment of a qualification (degree) based on the results of the state final certification and the issuance of a certificate of education and qualification;
- checking the readiness of the graduate for professional activity;
- development of proposals aimed at further improving the quality of training of graduates, improving the organization, content, methods and material and technical support of the educational process.

SFA is conducted at the final stage of training after passing theoretical training, educational and industrial practices, provided for by the curriculum in the direction of training 05.03.06 Ecology and nature management, profile " Ecological Engineering and New Energetics

SFA in the direction of training 05.03.06 Ecology and nature management is carried out in the form of a state examination and defense of the final qualification work (FQW).

The labor intensity of the SIA is 9 credit units (324 academic hours) and is carried out according to the curriculum for full-time education - on the 4th year.

## 3. LIST OF PLANNED RESULTS OF THE STATE FINAL CERTIFICATION, CORRELATED TO THE PLANNED RESULTS OF THE LEARNING OF THE EDUCATIONAL PROGRAM

### 3.1. The list of competencies that students must master as a result of mastering the educational program

As a result of mastering the EP, the graduate must have the following competencies:

Table 3.1

List of competencies

| Competency code | Content of the formulated competence  | Forms of certification                             |
|-----------------|---|--|
| УК-1            | Способен осуществлять поиск, анализ и синтез информации, применять системный подход для разрешения проблемных ситуаций              | Presentation of the Qualification Paper            |
| УК-2            | Способен определять круг задач в рамках поставленной цели и выбирать способы их решения, исходя из имеющихся ресурсов и ограничений | Presentation of the Qualification Paper            |
| УК-3            | Способен участвовать в реализации группового проекта  | Presentation of the Qualification Paper            |
| УК-4            | Способен осуществлять деловую коммуникацию на русском и иностранном языках в устной и письменной формах                             | Presentation of the Qualification Paper            |
| УК-5            | Способен воспринимать межкультурное разнообразие общества в социально-историческом и философском контекстах                         | Preparation for passing and passing the state exam |
| УК-6            | Способен управлять своими ресурсами, выстраивать и реализовывать траекторию саморазвития  | Presentation of the Qualification Paper            |

|         |  |  |
|---------|--|--|
| УК-7    | Способен поддерживать должный уровень физической подготовленности для обеспечения полноценной социальной и профессиональной деятельности   | Presentation of the Qualification Paper  |
| УК-8    | Способен создавать и поддерживать в повседневной жизни и в профессиональной деятельности безопасные условия жизнедеятельности для сохранения природной среды, обеспечения устойчивого развития общества, в том числе при угрозе и возникновении чрезвычайных ситуаций и военных конфликтов | Preparation for passing and passing the state exam   |
| УК-9    | Знает правовые и этические нормы, способен оценивать последствия нарушения этих норм   | Preparation for passing and passing the state exam   |
| УК – 10 | Способен использовать базовые дефектологические знания в социальной и профессиональной сферах  | Preparation for passing and passing the state exam   |
| УК-11   | Способен принимать обоснованные экономические решения в различных областях жизнедеятельности   | Presentation of the Qualification Paper  |
| УК-12   | Способен формировать нетерпимое отношение к коррупционному поведению   | Presentation of the Qualification Paper  |
| ОПК-1   | Владеет базовыми знаниями о современной научной картине мира на основе положений, законов и методов математических и естественных наук   | Preparation for passing and passing the state exam   |
| ОПК-2   | Способен понимать принципы работы современных информационно-коммуникационных технологий и использовать их для решения профессиональных задач с учетом требований информационной безопасности   | Presentation of the Qualification Paper  |
| ОПК-3   | Способен использовать теоретические основы экологии, геоэкологии, природопользования, охраны природы и наук об окружающей среде в профессиональной деятельности  | Preparation for passing and passing the state exam   |
| ОПК-4   | Способен применять базовые методы экологических исследований для решения задач профессиональной деятельности   | Presentation of the Qualification Paper  |
| ОПК-5   | Способен решать задачи профессиональной деятельности с использованием современных геоинформационных технологий   | Presentation of the Qualification Paper  |
| ОПК-6   | Способен осуществлять профессиональную деятельность в соответствии с нормативными правовыми актами в сфере экологии, природопользования и охраны природы, нормами профессиональной этики   | Presentation of the Qualification Paper  |
| ОПК-7   | Способен проектировать, представлять, защищать и распространять результаты своей профессиональной и научно-исследовательской деятельности  | Preparation for passing and passing the state exam   |
| ПК-1    | Способен осуществлять выполнение экспериментов и оформление результатов исследований и разработок  | Preparation for passing and passing the state exam / Presentation of the Qualification Paper |
| ПК-5    | Способен разрабатывать проекты и осуществлять контроль загрязнения атмосферного воздуха, водных объектов и образования отходов на предприятии  | Preparation for passing and passing the state exam / Presentation of the Qualification Paper |
| ПК-6    | Способен создавать, внедрять и осуществлять контроль системы производственного экологического контроля на предприятии  | Preparation for passing and passing the state exam / Presentation of the Qualification Paper |
| ПК-7    | Способен оценивать состояние окружающей среды для различных целей (экологический   | Preparation for passing and passing the state exam / Presentation of the                     |

|       |  |  |
|-------|--|--|
|       | мониторинг, оценка состояния отдельных компонентов природной среды, проведение инженерно-экологических изысканий, ОВОС) и на основе полученных данных разрабатывать рекомендации по использованию природных ресурсов, сохранению и восстановлению окружающей и природной среды   | Qualification Paper  |
| ПК-8  | Способен разрабатывать экологическую документацию организации в соответствии с установленными требованиями в области охраны окружающей среды, в том числе нормативы предельно допустимого воздействия  | Preparation for passing and passing the state exam / Presentation of the Qualification Paper |
| ПК-9  | Способен проектировать и создавать особо охраняемые природные территории, экологическое обустройство, экологические тропы, экологические сети и каркасы  | Preparation for passing and passing the state exam / Presentation of the Qualification Paper |
| ПК-10 | Способен разрабатывать и внедрять мероприятия, направленные на выполнение требований в области охраны окружающей среды, внедрению системы экологического менеджмента, разработке и функционировании системы экологического мониторинга, предупреждения возникновения чрезвычайных ситуаций природного и техногенного характера | Preparation for passing and passing the state exam / Presentation of the Qualification Paper |

### 3.2. Indicators, criteria and scales for assessing competencies

Each of the levels of competence formation corresponds to the assessment "excellent" (5), "good" (4), "satisfactory" (3) and "unsatisfactory" (2) in accordance with the established rating scale.

Table 3.2

Scale for assessing the formation of competencies

| Grading scale    | Evaluation criteria   |
|------------------|---|
| «Excellent»      | student must: demonstrate a deep and solid assimilation of knowledge of the material; exhaustively, consistently, competently and logically harmoniously present theoretical material; correctly formulate definitions; demonstrate the ability to work independently with normative and legal literature; be able to draw conclusions from the material presented              |
| «Good»           | student must: demonstrate a sufficiently complete knowledge of the material; demonstrate knowledge of basic theoretical concepts; sufficiently consistently, competently and logically harmoniously present the material; demonstrate the ability to navigate the regulatory literature; be able to draw sufficiently substantiated conclusions based on the material presented |
| «Satisfactory»   | the student must: demonstrate general knowledge of the material being studied; know the basic educational literature recommended by the discipline program; be able to build an answer in accordance with the structure of the question being presented; show general knowledge of the conceptual apparatus of the discipline   |
| «Unsatisfactory» | student must: not demonstrate general knowledge of the studied material; not know the main educational literature recommended by the discipline program; not be able to build an answer in accordance with the structure of the question being presented; do not show general knowledge of the conceptual apparatus of the discipline   |

Table 3.3

Criteria for determining the formation of competencies

| Criteria | Levels of competence formation                          |  |   |  |
|----------|---|--|---|--|
|          | Inadequate  | Threshold  | Base  | Tall   |
|          | The competence has been formed.<br>Demonstrates lack of | The competence has been formed.<br>Demonstrates an | The competence has been formed.<br>Demonstrates a | The competence has been formed.<br>Demonstrates a high |

|  |                                  |  |  |  |
|--|----------------------------------|--|--|--|
|  | independence and practical skill | insufficient level of independence of practical skills | sufficient level of independence of sustainable practical skills | level of independence, high adaptability of practical skills |
|--|----------------------------------|--|--|--|

Table 3.4

| Level formation of competence  | Assessment "know", "be able", "own"   | Scale evaluating |
|--|---|------------------|
| УК-1 Способен осуществлять поиск, анализ и синтез информации, применять системный подход для разрешения проблемных ситуаций              |   |                  |
| TALL   | <p>Know: methods of critical analysis and assessment of modern scientific achievements in ecology and nature management</p> <p>Be able to: gain new knowledge based on analysis, synthesis and other methods; collect data on complex scientific problems related to the field of ecology and nature management; search for information and solutions based on experimental actions</p> <p>Own: researching problems in ecology and nature management using analysis, synthesis and other methods of intellectual activity; identifying scientific problems and using adequate methods to solve them; demonstrating value judgments in solving problematic professional situations</p>  | 5                |
| BASE   | <p>Know: some methods of critical analysis and assessment of modern scientific achievements in ecology and nature management</p> <p>Be able to: partially obtain new knowledge based on analysis, synthesis and other methods; partially collect data on complex scientific problems related to the field of ecology and nature management; partially search for information and solutions based on experimental actions</p> <p>Own: a superficial study of problems in ecology and nature management using analysis, synthesis and other methods of intellectual activity; superficial identification of scientific problems and the use of adequate methods to solve them; partial demonstration of value judgments in solving problematic professional situations</p>                          | 4                |
| THRESHOLD  | <p>Know: methods of critical analysis and assessment of modern scientific achievements in ecology and environmental management, but not know the basic principles of critical analysis</p> <p>Be able to: gain new knowledge based on analysis, synthesis and other methods; but not be able to collect data on complex scientific problems related to the field of ecology and nature management; search for information and solutions based on experimental actions</p> <p>Own: researching problems in ecology and nature management using analysis, synthesis and other methods of intellectual activity; but not be proficient in identifying scientific problems and using adequate methods to solve them; demonstrating value judgments in solving problematic professional situations</p> | 3                |
| INADEQUATE   | <p>Don't know: methods of critical analysis and assessment of modern scientific achievements in ecology and nature management</p> <p>Not be able to: gain new knowledge based on analysis, synthesis and other methods; collect data on complex scientific problems related to the field of ecology and nature management; search for information and solutions based on experimental actions</p> <p>Do not possess: research of problems in ecology and nature management using analysis, synthesis and other methods of intellectual activity; identifying scientific problems and using adequate methods to solve them; demonstrating value judgments in solving problematic professional situations</p>   | 2                |
| УК-2 Способен определять круг задач в рамках поставленной цели и выбирать способы их решения, исходя из имеющихся ресурсов и ограничений |   |                  |
| TALL   | <p>Know: the legal basis for presenting and describing the results of environmental protection activities; legal norms for assessing the results of solving problems; legal norms applicable to methods of solving problems in</p>  | 5                |



| Level formation of competence                             | Assessment "know", "be able", "own"   | Scale evaluating |
|---|---|------------------|
|   | <p>ecology and nature management, based on the current legal norms, available resources and restrictions</p> <p>Be able to: substantiate the legal expediency of the results obtained; check and analyze environmental documentation; put forward innovative ideas and non-standard approaches to their implementation in ecology and nature management; analyze regulatory documents</p> <p>Own: legal norms in the field of ecology and nature management; legal norms for the development of technical specifications for the project, legal norms for the implementation of specialized professional work; legal norms for conducting a professional discussion of the results of activities</p>  |                  |
| BASE  | <p>Know: some legal basis for presenting and describing the results of conservation activities; some legal norms for evaluating the results of solving problems; some legal norms applied to the methods of solving problems of ecology and nature management, based on the current legal norms, available resources and restrictions</p> <p>Be able to: partially substantiate the legal expediency of the results obtained; partially check and analyze environmental documentation; partially put forward innovative ideas and non-standard approaches to their implementation in ecology and nature management; analyze regulatory documents</p> <p>Own: some legal norms in the field of ecology and nature management; some legal norms for the development of technical specifications for the project, legal norms for the implementation of specialized professional work; some legal norms for conducting a professional discussion of the results of activities</p>              | 4                |
| THRESHOLD   | <p>Know: the legal basis for presenting and describing the results of environmental protection activities; but do not know the legal rules for assessing the results of solving problems; legal norms applicable to methods of solving problems of ecology and nature management, based on the current legal norms, available resources and restrictions</p> <p>Be able to: substantiate the legal expediency of the results obtained; check and analyze environmental documentation; but not be able to put forward innovative ideas and non-standard approaches to their implementation in ecology and nature management; analyze regulatory documents</p> <p>Own: legal norms in the field of ecology and nature management; but not to possess the legal norms for the development of the technical task of the project, the legal norms for the implementation of specialized professional work; legal norms for conducting a professional discussion of the results of activities</p> | 3                |
| INADEQUATE  | <p>Don't know: the legal basis for presenting and describing the results of environmental protection activities; legal norms for assessing the results of solving problems; legal norms applicable to methods of solving problems in ecology and nature management, based on the current legal norms, available resources and restrictions</p> <p>Not be able to: substantiate the legal expediency of the results obtained; check and analyze environmental documentation; put forward innovative ideas and non-standard approaches to their implementation in ecology and nature management; analyze regulatory documents</p> <p>Do not own: legal norms in the field of ecology and nature management; legal norms for the development of technical specifications for the project, legal norms for the implementation of specialized professional work; legal norms for conducting a professional discussion of the results of activities</p>   | 2                |
| УК-3 Способен участвовать в реализации группового проекта |   |                  |
| TALL  | <p>Know: the problems of selecting an effective team; basic conditions for effective teamwork; fundamentals of strategic human resource management, regulatory legal acts concerning the organization and implementation of professional activities in the field of ecology and nature management; models of organizational behavior, factors of formation of organizational</p>  | 5                |

| Level formation of competence | Assessment "know", "be able", "own"  | Scale evaluating |
|-------------------------------|--|------------------|
|                               | <p>relations; strategies and principles of teamwork, the main characteristics of the organizational climate and the interaction of people in the organization; research methods in the field of management</p> <p>Be able to: determine the style of management and the effectiveness of team leadership; develop a team strategy; own the technology for the implementation of basic management functions, analyze interpret the results of scientific research in the field of human resource management; apply the principles and methods of organizing team activities; select methods and techniques for researching professional practical problems; be able to analyze and interpret the results of scientific research</p> <p>Own: the organization and management of team interaction in solving the set goals; creating a team to perform practical tasks in the field of ecology and nature management</p>  |                  |
| BASE                          | <p>Know: some of the problems of selecting an effective team; some conditions for effective teamwork; some fundamentals of strategic human resource management, regulatory legal acts concerning the organization and implementation of professional activities in the field of ecology and nature management; models of organizational behavior, factors of formation of organizational relations; some strategies and principles of teamwork, the main characteristics of the organizational climate and the interaction of people in the organization; some methods of scientific research in the field of management</p> <p>Be able to: partially determine the management style and the effectiveness of team leadership; partially develop a team strategy; partially own the technology for the implementation of basic management functions, analyze interpret the results of scientific research in the field of human resource management; apply the principles and methods of organizing team activities; partially select methods and techniques for researching professional practical problems; partially be able to analyze and interpret the results of scientific research</p> <p>Own: fragmentarily the organization and management of team interaction in solving the set goals; fragmentarily creating a team to perform practical tasks in the field of ecology and nature management</p> | 4                |
| THRESHOLD                     | <p>Know: the problems of selecting an effective team; basic conditions for effective teamwork; but do not know: the basics of strategic human resources management, regulatory legal acts concerning the organization and implementation of professional activities in the field of ecology and nature management; models of organizational behavior, factors of formation of organizational relations; strategies and principles of teamwork, the main characteristics of the organizational climate and the interaction of people in the organization; research methods in the field of management</p> <p>Be able to: determine the style of management and the effectiveness of team leadership; develop a team strategy; but not be able to master the technology for the implementation of basic management functions, analyze interpret the results of scientific research in the field of human resource management; apply the principles and methods of organizing team activities; select methods and techniques for researching professional practical problems; be able to analyze and interpret the results of scientific research</p> <p>Own: the organization and management of team interaction in solving the set goals; but not possess the skills to create a team to perform practical tasks in the field of ecology and nature management</p>  | 3                |
| INADEQUATE                    | <p>Don't know: problems of selecting an effective team; basic conditions for effective teamwork; fundamentals of strategic human resource management, regulatory legal acts concerning the organization and implementation of professional activities in the field of ecology and nature management; models of organizational behavior, factors of formation of organizational relations; strategies and principles of teamwork, the main characteristics of the organizational climate and the interaction of people in the organization; research methods in the field of management</p>   | 2                |

| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | <p>Not be able to: determine the style of management and the effectiveness of team leadership; develop a team strategy; own the technology for the implementation of basic management functions, analyze interpret the results of scientific research in the field of human resource management; apply the principles and methods of organizing team activities; select methods and techniques for researching professional practical problems; be able to analyze and interpret the results of scientific research</p> <p>Do not own: the organization and management of team interaction in solving the set goals; creating a team to perform practical tasks in the field of ecology and nature management</p>  |                  |
| УК-4 Способен осуществлять деловую коммуникацию на русском и иностранном языках в устной и письменной формах |  |                  |
| TALL   | <p>Know: principles of communication in professional ethics; factors of improving communication in the organization, communication technologies in professional interaction; characteristics of communication flows; the importance of communication in professional interaction; research methods of the communicative potential of a person; modern means of information and communication technologies</p> <p>Be able to: create in Russian and foreign languages written texts of scientific and official-business styles of speech on professional issues; investigate the passage of information on management communications; define internal communications in the organization; make editorial and proofreading of texts of scientific and official-business styles of speech in Russian and foreign languages; own the principles of forming a communication system; analyze the system of communication links in the organization</p> <p>Own: implementation of methods of oral and written communication, including in a foreign language; presentation of plans and results of own and team activities using communication technologies</p>   | 5                |
| BASE   | <p>Know: some principles of communication in professional ethics; some factors for improving communication in the organization, communication technologies in professional interaction; some characteristics of communication flows; some of the importance of communication in professional interaction; some methods of researching the communicative potential of a person; modern means of information and communication technologies</p> <p>Be able to: partially create in Russian and foreign languages written texts of scientific and official-business styles of speech on professional issues; to fragmentarily investigate the passage of information on management communications; define internal communications in the organization; to partially make editorial and proofreading of texts of scientific and official-business styles of speech in Russian and foreign languages; partially own the principles of forming a communication system; analyze the system of communication links in the organization</p> <p>Own: implementation of methods of oral and written communication, including in a foreign language with minor errors; presentation of plans and results of own and team activities using communication technologies with minor errors</p> | 4                |
| THRESHOLD  | <p>Know: principles of communication in professional ethics; but not to know: factors of improving communication in the organization, communication technologies in professional interaction; characteristics of communication flows; the importance of communication in professional interaction; research methods of the communicative potential of a person; modern means of information and communication technologies</p> <p>Be able to: create in Russian and foreign languages written texts of scientific and official-business styles of speech on professional issues; but not be able to investigate the passage of information through management communications; define internal communications in the organization; make editorial and proofreading of texts of scientific and official-business styles</p>  | 3                |

| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | <p>of speech in Russian and foreign languages; own the principles of forming a communication system; analyze the system of communication links in the organization</p> <p>Own: implementation of methods of oral and written communication, including in a foreign language; but not have the skills to present plans and results of their own and team activities using communication technologies</p>  |                  |
| INADEQUATE   | <p>Don't know: principles of communication in professional ethics; factors of improving communication in the organization, communication technologies in professional interaction; characteristics of communication flows; the importance of communication in professional interaction; research methods of the communicative potential of a person; modern means of information and communication technologies</p> <p>Not be able to: create in Russian and foreign languages written texts of scientific and official-business styles of speech on professional issues; investigate the passage of information on management communications; define internal communications in the organization; make editorial and proofreading of texts of scientific and official-business styles of speech in Russian and foreign languages; own the principles of forming a communication system; analyze the system of communication links in the organization</p> <p>Do not own: implementation of methods of oral and written communication, including in a foreign language; presentation of plans and results of own and team activities using communication technologies</p>  | 2                |
| УК-5 Способен воспринимать межкультурное разнообразие общества в социально-историческом и философском контекстах |  |                  |
| TALL   | <p>Know: the psychological foundations of social interaction; aimed at solving professional problems in the field of ecology and nature management; basic principles of organizing business contacts; methods of preparation for negotiations, national, ethnocultural and confessional characteristics and folk traditions of the population; basic concepts of human interaction in an organization, features of dyadic interaction</p> <p>To be able to: competently, easily present environmental information in the process of intercultural interaction; respect ethical norms and human rights; analyze the features of social interaction, taking into account national, ethnocultural, confessional characteristics</p> <p>Own: the organization of productive interaction in a professional environment, taking into account national, ethnocultural, confessional characteristics; overcoming communicative, educational, ethnic, confessional and other barriers in the process of intercultural interaction; identifying the diversity of cultures in the process of intercultural interaction</p>  | 5                |
| BASE   | <p>Know: some of the psychological foundations of social interaction; aimed at solving professional problems in the field of ecology and nature management; some principles of organizing business contacts; some methods of preparation for negotiations, national, ethnocultural and confessional characteristics and folk traditions of the population; some concepts of human interaction in an organization, features of dyadic interaction</p> <p>To be able to: without blunders, it is easy to present environmental information in the process of intercultural interaction; respect ethical norms and human rights; to partially analyze the features of social interaction, taking into account national, ethnocultural, confessional characteristics</p> <p>Own: the organization of productive interaction in a professional environment, taking into account national, ethnocultural, confessional characteristics with minor errors; overcoming some communicative, educational, ethnic, confessional and other barriers in the process of intercultural interaction; identifying the diversity of cultures in the process of intercultural interaction</p> | 4                |
| THRESHOLD  | <p>Know: the psychological foundations of social interaction; aimed at solving professional problems in the field of ecology and nature</p>  | 3                |

| Level formation of competence   | Assessment "know", "be able", "own"  | Scale evaluating |
|---|--|------------------|
|   | <p>management; but do not know the basic principles of organizing business contacts; methods of preparation for negotiations, national, ethnocultural and confessional characteristics and folk traditions of the population; basic concepts of human interaction in an organization, features of dyadic interaction</p> <p>To be able to: competently, easily present environmental information in the process of intercultural interaction; but fail to observe ethical norms and human rights; analyze the features of social interaction, taking into account national, ethnocultural, confessional characteristics</p> <p>Own: the organization of productive interaction in a professional environment, taking into account national, ethnocultural, confessional characteristics; but not possess the skills to overcome communicative, educational, ethnic, confessional and other barriers in the process of intercultural interaction; identifying the diversity of cultures in the process of intercultural interaction</p>   |                  |
| INADEQUATE  | <p>Don't know: the psychological foundations of social interaction; aimed at solving professional problems in the field of ecology and nature management; basic principles of organizing business contacts; methods of preparation for negotiations, national, ethnocultural and confessional characteristics and folk traditions of the population; basic concepts of human interaction in an organization, features of dyadic interaction</p> <p>Not be able to: competently, clearly present environmental information in the process of intercultural interaction; respect ethical norms and human rights; analyze the features of social interaction, taking into account national, ethnocultural, confessional characteristics</p> <p>Do not own: the organization of productive interaction in a professional environment, taking into account national, ethnocultural, confessional characteristics; overcoming communicative, educational, ethnic, confessional and other barriers in the process of intercultural interaction; identifying the diversity of cultures in the process of intercultural interaction</p> | 2                |
| УК-6 Способен управлять своими ресурсами, выстраивать и реализовывать траекторию саморазвития |  |                  |
| TALL  | <p>Know: the content of self-organization and self-education processes, their features and implementation technologies, based on the goals of improving professional activities in the field of ecology and nature management</p> <p>Be able to: plan goals and set priorities in the implementation of activities; independently build the process of mastering information, selected and structured for performing professional activities in the field of ecology and nature management</p> <p>Own: technologies for organizing the process of self-education and self-organization; methods of goal-setting in the time perspective, methods of planning, organization, self-control and self-assessment of activities in the field of ecology and nature management</p>   | 5                |
| BASE  | <p>Know: the content of self-organization and self-education processes, their features and implementation technologies, based on the goals of improving professional activities in the field of ecology and environmental management (demonstrates knowledge of the content and features of self-organization and self-education processes, but gives an incomplete justification for the correspondence of the selected technologies for implementing processes to the goals of professional growth).</p> <p>Be able to: plan goals and set priorities in the implementation of activities; independently build the process of mastering information, selected and structured for performing professional activities in the field of ecology and nature management (it may be difficult to justify the chosen goals and priorities).</p> <p>Own: technologies for organizing the process of self-education and self-organization in the field of ecology and nature management</p>  | 4                |
| THRESHOLD   | Know: the content of self-organization and self-education processes,   | 3                |

| Level formation of competence   | Assessment "know", "be able", "own"   | Scale evaluating |
|---|---|------------------|
|   | <p>their features (makes significant mistakes when disclosing the content and characteristics of self-organization and self-education processes) in the field of ecology and nature management</p> <p>Be able to: plan goals and set priorities in the implementation of activities; build the process of mastering information, selected and structured for performing professional activities in the field of ecology and nature management (makes mistakes; experiences difficulties in planning and setting priorities).</p> <p>Own: technologies for organizing the process of self-education and self-organization in the field of ecology and nature management (owns certain methods of self-education and self-regulation, makes mistakes in their implementation).</p>                                      |                  |
| INADEQUATE  | <p>Don't know: the content of self-organization and self-education processes, their features and implementation technologies, based on the goals of improving professional activities in the field of ecology and nature management</p> <p>Not be able to: plan goals and set priorities in the implementation of activities; independently build the process of mastering information, selected and structured for performing professional activities in the field of ecology and nature management</p> <p>Do not own: technologies for organizing the process of self-education and self-organization; methods of goal-setting in the time perspective, methods of planning, organization, self-control and self-assessment of activities in the field of ecology and nature management</p>                         | 2                |
| УК-7 Способен поддерживать должный уровень физической подготовленности для обеспечения полноценной социальной и профессиональной деятельности |   |                  |
| TALL  | <p>Know: patterns of functioning of a healthy organism; principles of distribution of physical activity; standards of physical readiness for the general physical group and taking into account the individual conditions of the physical development of the human body; ways to promote a healthy lifestyle</p> <p>Be able to: maintain the proper level of physical fitness; correctly distribute the loads; develop an individual physical training program that takes into account the individual characteristics of the development of the body</p> <p>Own: methods of maintaining the proper level of physical fitness; skills to ensure full-fledged social and professional activities; basic methods of promoting a healthy lifestyle</p>  | 5                |
| BASE  | <p>Know: some patterns of functioning of a healthy organism; some principles of the distribution of physical activity; some standards of physical readiness for the general physical group and taking into account the individual conditions of the physical development of the human body; some ways to promote healthy lifestyles</p> <p>Be able to: maintain an average level of physical fitness; correctly distribute loads without blunders; develop an individual program of physical training, taking into account the individual characteristics of the development of the body without gross flaws</p> <p>Own: some methods of maintaining the proper level of physical fitness; skills to ensure full-fledged social and professional activities; fragmentary methods of promoting a healthy lifestyle</p> | 4                |
| THRESHOLD   | <p>Know: patterns of functioning of a healthy organism; principles of distribution of physical activity; but not to know the standards of physical readiness for the general physical group and taking into account the individual conditions of the physical development of the human body; ways to promote a healthy lifestyle</p> <p>Be able to: maintain a low level of physical fitness; correctly distribute the loads; but not be able to develop an individual physical training program that takes into account the individual characteristics of the development of the body</p>  | 3                |

| Level formation of competence   | Assessment "know", "be able", "own"  | Scale evaluating |
|---|--|------------------|
|   | Own: methods of maintaining the proper level of physical fitness; but not possess the skills to ensure full-fledged social and professional activities; basic methods of promoting a healthy lifestyle   |                  |
| INADEQUATE  | <p>Don't know: the regularities of the functioning of a healthy organism; principles of distribution of physical activity; standards of physical readiness for the general physical group and taking into account the individual conditions of the physical development of the human body; ways to promote a healthy lifestyle</p> <p>Not be able to: maintain the proper level of physical fitness; correctly distribute the loads; develop an individual physical training program that takes into account the individual characteristics of the development of the body</p> <p>Do not own: methods of maintaining the proper level of physical fitness; skills to ensure full-fledged social and professional activities; basic methods of promoting a healthy lifestyle</p>  | 2                |
| УК-8 Способен создавать и поддерживать в повседневной жизни и в профессиональной деятельности безопасные условия жизнедеятельности для сохранения природной среды, обеспечения устойчивого развития общества, в том числе при угрозе и возникновении чрезвычайных ситуаций и военных конфликтов |  |                  |
| TALL  | <p>Know: scientifically grounded methods of maintaining safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts</p> <p>Be able to: create and maintain safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts</p> <p>Possess: skills to prevent emergencies and military conflicts; first aid receptions; basic medical knowledge; ways to maintain civil defense and conditions to minimize the consequences of emergency situations</p>   | 5                |
| BASE  | <p>Know: some scientifically grounded ways of maintaining safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts</p> <p>Be able to: create and maintain safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts without gross deficiencies</p> <p>Possess: partially skills in prevention of emergencies and military conflicts; first aid receptions; basic medical knowledge; ways to maintain civil defense and conditions to minimize the consequences of emergency situations</p>  | 4                |
| THRESHOLD   | <p>Know: the basics of scientifically based methods of maintaining safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts</p> <p>Be able to: not systematically create and maintain safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts</p> <p>Possess: basic skills in the prevention of emergencies and military conflicts; first aid receptions; basic medical knowledge; ways to maintain civil defense and conditions to minimize the consequences of emergency situations</p> | 3                |
| INADEQUATE  | <p>Don't know: scientifically grounded methods of maintaining safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts</p> <p>Not be able to: create and maintain safe living conditions in everyday life and in professional activity to preserve the natural environment, ensure</p>   | 2                |

| Level formation of competence   | Assessment "know", "be able", "own"  | Scale evaluating |
|---|--|------------------|
|   | sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts<br>Do not possess: skills to prevent emergencies and military conflicts; first aid receptions; basic medical knowledge; ways to maintain civil defense and conditions to minimize the consequences of emergency situations |                  |
| УК-9 Знает правовые и этические нормы, способен оценивать последствия нарушения этих норм           |  |                  |
| TALL  | Know: legal and ethnic norms<br>Be able to: assess the consequences of violation of legal and ethnic norms<br>Possess: skills in applying legal and ethnic norms in their work   | 5                |
| BASE  | Know: some legal and ethnic norms<br>Be able to: partially assess the consequences of violation of legal and ethnic norms<br>Have: some skills in applying legal and ethnic norms in their work  | 4                |
| THRESHOLD   | Know: legal and do not know ethnic norms<br>Be able to: partially assess the consequences of violation of legal and ethnic norms with gross errors<br>Possess: some skills in applying legal and ethnic norms in their work with gross errors  | 3                |
| INADEQUATE  | Don't know: legal and ethnic norms<br>Not be able to: assess the consequences of violation of legal and ethnic norms<br>Do not possess: skills to apply legal and ethnic norms in their work   | 2                |
| УК-10 Способен использовать базовые дефектологические знания в социальной и профессиональной сферах |  |                  |
| TALL  | Know: basic defectological terms and components of inclusive competence<br>Be able to: apply basic defectological knowledge in social and professional spheres<br>Possess: skills of interaction in professional and social spheres with persons with disabilities and people with disabilities  | 5                |
| BASE  | Know: some defectological terms and components of inclusive competence<br>Be able to: apply basic defectological knowledge in social and professional spheres with minor errors<br>Possess: some skills of interaction in professional and social spheres with persons with disabilities and people with disabilities                                    | 4                |
| THRESHOLD   | Know: about having inclusive competence<br>Be able to: apply basic defectological knowledge in social and professional spheres with minor errors<br>Possess: at a low level of interaction skills in the professional and social spheres with persons with disabilities and people with disabilities   | 3                |
| INADEQUATE  | Don't know: basic defectological terms and components of inclusive competence<br>Not be able to: apply basic defectological knowledge in social and professional spheres<br>Do not possess: skills of interaction in the professional and social spheres with persons with disabilities and people with disabilities                                     | 2                |
| УК-11 Способен принимать обоснованные экономические решения в различных областях жизнедеятельности  |  |                  |
| TALL  | Know: the basics of economic and financial issues for making informed economic decisions in various areas of life<br>Be able to: use economic and financial knowledge in different areas of life to make informed economic decisions<br>Possess: the skill of making informed economic and financial decisions in various areas of life                  | 5                |
| BASE  | Know: some economic and financial issues for making informed economic decisions in various areas of life<br>Be able to: partially use economic and financial knowledge in different areas of life to make informed economic decisions<br>Possess: the skill of making informed economic and financial decisions  | 4                |



| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | in various areas of life at an intermediate level  |                  |
| THRESHOLD  | <p>Know: some economic and financial issues for making informed economic decisions in various areas of life</p> <p>Be able to: apply economic and financial knowledge not for all areas of life</p> <p>Possess: the skill of making informed economic and financial decisions in various areas of life at a low level</p>  | 3                |
| INADEQUATE   | <p>Don't know: the basics of economic and financial issues for making informed economic decisions in various areas of life</p> <p>Not be able to: use economic and financial knowledge in different areas of life to make informed economic decisions</p> <p>Do not possess: the skill of making informed economic and financial decisions in various areas of life</p>  | 2                |
| УК-12 Способен формировать нетерпимое отношение к коррупционному поведению   |  |                  |
| TALL   | <p>Know: the essence and characteristics of corrupt behavior, the reasons for its appearance and the forms of its manifestation in various spheres of public life</p> <p>Be able to: identify signs of corrupt behavior</p> <p>Possess: skills of counteracting various manifestations of corrupt behavior</p>   | 5                |
| BASE   | <p>Know: the main characteristics of corrupt behavior, some of the reasons for its appearance and forms of its manifestation in various spheres of public life</p> <p>Be able to: identify signs of corrupt behavior with minor errors</p> <p>Possess: skills in counteracting various manifestations of corrupt behavior at the intermediate level</p>  | 4                |
| THRESHOLD  | <p>Know: the main characteristics of corrupt behavior in various spheres of public life</p> <p>Be able to: identify signs of corrupt behavior with blunders</p> <p>Possess: skills to counteract various manifestations of corrupt behavior at a low level</p>   | 3                |
| INADEQUATE   | <p>Don't know: the essence and characteristics of corrupt behavior, the reasons for its appearance and the forms of its manifestation in various spheres of public life</p> <p>Not be able to: identify signs of corrupt behavior</p> <p>Do not possess: skills to counteract various manifestations of corrupt behavior</p>   | 2                |
| ОПК-1 Владеет базовыми знаниями о современной научной картине мира на основе положений, законов и методов математических и естественных наук |  |                  |
| TALL   | <p>Know: modern ideas about the picture of the world based on the provisions, laws and methods of natural sciences</p> <p>Be able to: use knowledge about the modern scientific picture of the world in their practice</p> <p>Possess: the skills of searching for information about the modern scientific picture of the world based on the provisions, laws and methods of the natural sciences at a high level</p>                          | 5                |
| BASE   | <p>Know: some ideas about the picture of the world based on the provisions, laws and methods of natural sciences</p> <p>Be able to: use knowledge about the modern scientific picture of the world in their practice with minor flaws</p> <p>Possess: the skills of searching for information about the modern scientific picture of the world based on the provisions, laws and methods of the natural sciences at the intermediate level</p> | 4                |
| THRESHOLD  | <p>Know: some ideas about the picture of the world without relying on the provisions, laws and methods of natural sciences</p> <p>Be able to: use knowledge about the modern scientific picture of the world in their practice with gross flaws</p> <p>Possess: the skills of searching for information about the modern scientific picture of the world based on the provisions, laws and methods of</p>                                      | 3                |

| Level formation of competence  | Assessment "know", "be able", "own"   | Scale evaluating |
|--|---|------------------|
|  | natural sciences at a low level   |                  |
| INADEQUATE   | <p>Don't know: modern ideas about the picture of the world based on the provisions, laws and methods of natural sciences</p> <p>Not be able to: use knowledge about the modern scientific picture of the world in their practice</p> <p>Do not possess: the skills of searching for information about the modern scientific picture of the world based on the provisions, laws and methods of the natural sciences at a high level</p>  | 2                |
| ОПК-2 Способен понимать принципы работы современных информационно-коммуникационных технологий и использовать их для решения профессиональных задач с учетом требований информационной безопасности |   |                  |
| TALL   | <p>Know: modern information and communication technologies</p> <p>Be able to: apply modern information and communication technologies to solve professional problems, taking into account the requirements of information security</p> <p>Possess: skills in working with modern information and communication technologies to solve professional problems, taking into account the requirements of information security</p>  | 5                |
| BASE   | <p>Know: some modern information and communication technologies</p> <p>Be able to: apply modern information and communication technologies to solve professional problems, taking into account the requirements of information security with small errors</p> <p>Possess: skills of working with modern information and communication technologies to solve professional at the intermediate level</p>  | 4                |
| THRESHOLD  | <p>Know: Basics of Information and Communication Technology</p> <p>Be able to: apply modern information and communication technologies to solve professional problems with gross errors without taking into account the requirements of information security</p> <p>Possess: skills of working with modern information and communication technologies to solve professional at a low level</p>  | 3                |
| INADEQUATE   | <p>Don't know: modern information and communication technologies</p> <p>Not be able to: apply modern information and communication technologies to solve professional problems, taking into account the requirements of information security</p> <p>Do not possess: skills of working with modern information and communication technologies to solve professional</p>  | 2                |
| ОПК-3 Способен использовать теоретические основы экологии, геоэкологии, природопользования, охраны природы и наук об окружающей среде в профессиональной деятельности                              |   |                  |
| TALL   | <p>Know: basic theories, teachings and concepts in ecology, geoecology, nature management, nature conservation and environmental sciences</p> <p>Be able to: apply basic theories, teachings and concepts to solve practical problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences</p> <p>Possess: the skills of searching and processing information about theories, teachings and concepts for solving problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences</p>  | 5                |
| BASE   | <p>Know: some theories, teachings and concepts in the field of ecology, geoecology, nature management, nature conservation and environmental sciences</p> <p>Be able to: apply basic theories, teachings and concepts to solve practical problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences with minor flaws</p> <p>Possess: the skills of searching and processing information about theories, teachings and concepts for solving problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences at the intermediate level</p> | 4                |
| THRESHOLD  | <p>Know: some theories, teachings and concepts in the field of ecology, geoecology, nature management, nature conservation and environmental sciences</p>   | 3                |

| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | <p>Be able to: apply basic theories, teachings and concepts to solve practical problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences with gross flaws</p> <p>Possess: the skills of searching and processing information about theories, teachings and concepts to solve problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences at a low level</p>  |                  |
| INADEQUATE   | <p>Don't know: basic theories, teachings and concepts in ecology, geoecology, nature management, nature conservation and environmental sciences</p> <p>Not be able to: apply basic theories, teachings and concepts to solve practical problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences</p> <p>Not possess: the skills of searching and processing information about theories, teachings and concepts for solving problems in the field of ecology, geoecology, nature management, nature conservation and environmental sciences</p> | 2                |
| ОПК-4 Способен применять базовые методы экологических исследований для решения задач профессиональной деятельности   |  |                  |
| TALL   | <p>Know: basic environmental research methods for solving professional problems</p> <p>Be able to: apply basic methods of environmental research to solve problems of professional activity</p> <p>Possess: the ability to master new methods of environmental research to solve the problems of professional activity</p>   | 5                |
| BASE   | <p>Know: some methods of environmental research to solve the problems of professional activity</p> <p>Be able to: apply basic methods of environmental research to solve professional problems with minor errors</p> <p>Possess: the ability to master new methods of environmental research to solve the problems of professional activity at the intermediate level</p>  | 4                |
| THRESHOLD  | <p>Know: some methods of environmental research to solve the problems of professional activity</p> <p>Be able to: apply basic methods of environmental research to solve problems of professional activity with gross errors</p> <p>Possess: the ability to master new methods of environmental research to solve the problems of professional activity at a low level</p>   | 3                |
| INADEQUATE   | <p>Don't know: basic environmental research methods for solving professional problems</p> <p>Not be able to: apply basic methods of environmental research to solve professional problems</p> <p>Do not possess: the ability to master new methods of environmental research to solve the problems of professional activity</p>  | 2                |
| ОПК-5 Способен решать задачи профессиональной деятельности с использованием современных геоинформационных технологий |  |                  |
| TALL   | <p>Know: the theoretical foundations of modern geoinformation technologies</p> <p>Be able to: use modern geoinformation technologies as a tool in their professional activities</p> <p>Possess: skills in working with modern geoinformation technologies</p>  | 5                |
| BASE   | <p>Know: partially theoretical foundations of modern geoinformation technologies</p> <p>Be able to: use modern geoinformation technologies with minor errors as a tool in their professional activities</p> <p>Possess: skills in working with modern geoinformation technologies at an intermediate level</p>   | 4                |
| THRESHOLD  | <p>Know: partially theoretical foundations of modern geoinformation technologies</p> <p>Be able to: use modern geoinformation technologies with gross errors</p>   | 3                |

| Level formation of competence  | Assessment "know", "be able", "own"   | Scale evaluating |
|--|---|------------------|
|  | as a tool in their professional activities<br>Possess: skills of working with modern geoinformation technologies at a low level   |                  |
| INADEQUATE   | Don't know: theoretical foundations of modern geoinformation technologies<br>Not be able to: use modern geoinformation technologies as a tool in their professional activities<br>Do not own: skills of working with modern geoinformation technologies   | 2                |
| ОПК-6 Способен осуществлять профессиональную деятельность в соответствии с нормативными правовыми актами в сфере экологии, природопользования и охраны природы, нормами профессиональной этики |   |                  |
| TALL   | Know: the main regulatory legal acts in the field of ecology, nature management and nature protection<br>Be able to: use normative legal acts in the field of ecology, nature management and nature protection, the norms of professional ethics in their professional activities<br>Own: in the search and analysis of regulatory legal acts in the field of ecology, nature management and nature protection  | 5                |
| BASE   | Know: some regulatory legal acts in the field of ecology, nature management and nature protection<br>Be able to: use normative legal acts in the field of ecology, nature management and nature protection, the norms of professional ethics in their professional activities with minor errors<br>Own: in the search and analysis of normative legal acts in the field of ecology, nature management and nature protection at the middle level               | 4                |
| THRESHOLD  | Know: with significant gaps, regulatory legal acts in the field of ecology, nature management and nature protection<br>Be able to: use normative legal acts in the field of ecology, nature management and nature protection, the norms of professional ethics in their professional activities with gross errors<br>Own: in the search and analysis of regulatory legal acts in the field of ecology, nature management and nature protection at a low level | 3                |
| INADEQUATE   | Know: the main regulatory legal acts in the field of ecology, nature management and nature protection<br>Be able to: use normative legal acts in the field of ecology, nature management and nature protection, the norms of professional ethics in their professional activities<br>Own: in the search and analysis of regulatory legal acts in the field of ecology, nature management and nature protection  | 2                |
| ОПК-7 Способен проектировать, представлять, защищать и распространять результаты своей профессиональной и научно-исследовательской деятельности  |   |                  |
| TALL   | Know: the specifics of designing, presenting, protecting and disseminating the results of their professional and research activities<br>Be able to: design, represent, defend and disseminate the results of their professional and research activities<br>Possess: skills in design, presentation, protection and dissemination of the results of their professional and research activities   | 5                |
| BASE   | Know: some of the features of the design, presentation, protection and dissemination of the results of their professional and research activities<br>Be able to: design, represent, protect and disseminate the results of their professional and research activities with minor errors<br>Possess: skills in design, presentation, protection and dissemination of the results of their professional and research activities at an intermediate level        | 4                |
| THRESHOLD  | Know: some of the features of the design, presentation, protection and dissemination of the results of their professional and research activities<br>Be able to: design, represent, defend and disseminate the results of their professional and research activities with gross errors<br>Possess: skills in design, presentation, protection and dissemination of  | 3                |

| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | the results of their professional and research activities at a low level   |                  |
| INADEQUATE   | <p>Don't know: features of design, presentation, protection and dissemination of the results of their professional and research activities</p> <p>Not be able to: design, represent, defend and disseminate the results of their professional and research activities</p> <p>Do not possess: skills to design, represent, protect and disseminate the results of their professional and research activities</p>  | 2                |
| ПК-1 Способен осуществлять выполнение экспериментов и оформление результатов исследований и разработок   |  |                  |
| TALL   | <p>Know: the methodology for performing experiments and the design features of research and development results</p> <p>Be able to: carry out experiments and document the results of research and development</p> <p>Possess: the skills of conducting experiments and reporting the results of research and development</p>   | 5                |
| BASE   | <p>Know: partially the methodology for performing experiments and the peculiarities of the design of research and development results</p> <p>Be able to: perform experiments and document research and development results with minor errors</p> <p>Possess: the skills of conducting experiments and reporting the results of research and development at an intermediate level</p>   | 4                |
| THRESHOLD  | <p>Know: partially the methodology for performing experiments and make inaccuracies in the presentation of research and development results</p> <p>Be able to: carry out experiments and document the results of research and development with gross errors</p> <p>Possess: the skills of conducting experiments and reporting the results of research and development at a low level</p>  | 3                |
| INADEQUATE   | <p>Don't know: the methodology for performing experiments and the peculiarities of the design of the results of research and development</p> <p>Not be able to: carry out experiments and document the results of research and development</p> <p>Do not possess: the skills of conducting experiments and reporting the results of research and development</p>   | 2                |
| ПК-5 Способен разрабатывать проекты и осуществлять контроль загрязнения атмосферного воздуха, водных объектов и образования отходов на предприятии |  |                  |
| TALL   | <p>Know: the regulatory framework in the field of regulation and control of air pollution, water bodies and waste generation</p> <p>Be able to: develop projects and monitor air pollution, water bodies and waste generation at the enterprise</p> <p>Possess: skills in collecting and analyzing information for the development of projects and control of air pollution, water bodies and waste generation at the enterprise</p>   | 5                |
| BASE   | <p>Know: partially the regulatory framework in the field of regulation and control of air pollution, water bodies and waste generation</p> <p>Be able to: develop projects and monitor air pollution, water bodies and waste generation at the enterprise with minor errors</p> <p>Possess: skills in collecting and analyzing information for developing projects and monitoring air pollution, water bodies and waste generation at the enterprise at an average level</p>       | 4                |
| THRESHOLD  | <p>Know: superficially the regulatory framework in the field of regulation and control of air pollution, water bodies and waste generation</p> <p>Be able to: develop projects and monitor air pollution, water bodies and waste generation at an enterprise with gross errors</p> <p>Possess: skills in collecting and analyzing information for the development of projects and control of air pollution, water bodies and waste generation at the enterprise at a low level</p> | 3                |
| INADEQUATE   | <p>Don't know: regulatory framework in the field of regulation and control of air pollution, water bodies and waste generation</p> <p>Not be able to: develop projects and monitor air pollution, water bodies</p>   | 2                |

| Level formation of competence  | Assessment "know", "be able", "own"   | Scale evaluating |
|--|---|------------------|
|  | and waste generation at the enterprise<br>Not possess: skills in collecting and analyzing information for developing projects and monitoring air pollution, water bodies and waste generation at the enterprise   |                  |
| ПК-6 Способен создавать, внедрять и осуществлять контроль системы производственного экологического контроля на предприятии   |   |                  |
| TALL   | Know: the basics of the industrial environmental control system at the enterprise<br>Be able to: create, implement and monitor the industrial environmental control system at the enterprise<br>Possess: skills in collecting and analyzing information for the creation, implementation and control of the industrial environmental control system at the enterprise   | 5                |
| BASE   | Know: partly the basics of the industrial environmental control system at the enterprise<br>Be able to: create, implement and monitor the industrial environmental control system at the enterprise with minor errors<br>Possess: skills in collecting and analyzing information for the creation, implementation and control of the industrial environmental control system at the enterprise at the middle level  | 4                |
| THRESHOLD  | Know: superficially the basics of the industrial environmental control system at the enterprise<br>Be able to: create, implement and monitor the system of industrial environmental control at the enterprise with gross errors<br>Possess: skills in collecting and analyzing information for the creation, implementation and control of a production environmental control system at an enterprise at a low level  | 3                |
| INADEQUATE   | Don't know: the basics of an industrial environmental control system at an enterprise<br>Not be able to: create, implement and monitor the industrial environmental control system at the enterprise<br>Do not possess: skills in collecting and analyzing information for the creation, implementation and control of the industrial environmental control system at the enterprise  | 2                |
| ПК-7 Способен оценивать состояние окружающей среды для различных целей (экологический мониторинг, оценка состояния отдельных компонентов природной среды, проведение инженерно-экологических изысканий, ОВОС) и на основе полученных данных разрабатывать рекомендации по использованию природных ресурсов, сохранению и восстановлению окружающей и природной среды |   |                  |
| TALL   | Know: the specifics of assessing the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting engineering and environmental surveys, EIA) and developing recommendations for the use of natural resources, preservation and restoration of the environment and natural environment<br>Be able to: assess the state of the environment for various purposes (environmental monitoring, assessment of the state of individual components of the natural environment, conduct engineering and environmental surveys, EIA) and, on the basis of the data obtained, develop recommendations for the use of natural resources, preservation and restoration of the environment and natural environment<br>Possess: skills in collecting and analyzing information to assess the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting engineering and environmental surveys, EIA) and, on the basis of the data obtained, develop recommendations for the use of natural resources, conservation and restoration environment and natural environment | 5                |
| BASE   | Know: some features of assessing the state of the environment for various purposes (environmental monitoring, assessing the state of  | 4                |

| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | <p>individual components of the natural environment, conducting engineering and environmental surveys, EIA) and developing recommendations for the use of natural resources, preservation and restoration of the environment and natural environment</p> <p>Be able to: assess the state of the environment for various purposes (environmental monitoring, assessment of the state of individual components of the natural environment, conduct engineering and environmental surveys, EIA) and, based on the data obtained, develop recommendations for the use of natural resources, preservation and restoration of the environment and natural environment with minor errors</p> <p>Possess: skills in collecting and analyzing information for assessing the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting engineering and environmental surveys, EIA) and, based on the data obtained, develop recommendations for the use of natural resources, conservation and restoration environment and natural environment at an average level</p>  |                  |
| THRESHOLD  | <p>Know: superficially the features of assessing the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting engineering and environmental surveys, EIA) and developing recommendations for the use of natural resources, preservation and restoration of the environment and natural environment</p> <p>Be able to: assess the state of the environment for various purposes (environmental monitoring, assessment of the state of individual components of the natural environment, conduct engineering and environmental surveys, EIA) and, on the basis of the data obtained, develop recommendations for the use of natural resources, preservation and restoration of the environment and natural environment with gross errors</p> <p>Possess: skills in collecting and analyzing information to assess the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting engineering and environmental surveys, EIA) and, on the basis of the data obtained, develop recommendations for the use of natural resources, conservation and restoration environment and natural environment at a low level</p> | 3                |
| INADEQUATE   | <p>Don't know: features of assessing the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting engineering and environmental surveys, EIA) and developing recommendations for the use of natural resources, preservation and restoration of the environment and natural environment</p> <p>Not be able to: assess the state of the environment for various purposes (environmental monitoring, assessment of the state of individual components of the natural environment, conduct engineering and environmental surveys, EIA) and, on the basis of the data obtained, develop recommendations for the use of natural resources, preservation and restoration of the environment and natural environment</p> <p>Not possess: skills in collecting and analyzing information for assessing the state of the environment for various purposes (environmental monitoring, assessing the state of individual components of the natural environment, conducting environmental engineering surveys, EIA) and, on the basis of the data obtained, develop recommendations for the use of natural resources, conservation and restoration of the environment and natural environment</p>                               | 2                |
| ПК-8 Способен разрабатывать экологическую документацию организации в соответствии с установленными требованиями в области охраны окружающей среды, в том числе нормативы предельно допустимого воздействия |  |                  |
| TALL   | Know: features of the development of environmental documentation of  | 5                |

| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
|  | <p>the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure</p> <p>Be able to: develop environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure</p> <p>Possess: skills in collecting and analyzing information for the development of environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure</p>   |                  |
| BASE   | <p>Know: some features of the development of environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure</p> <p>Be able to: develop environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure with minor errors</p> <p>Possess: skills in collecting and analyzing information for the development of environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure at the average level</p> | 4                |
| THRESHOLD  | <p>Know: superficially features of the development of environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure</p> <p>Be able to: develop environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure with gross errors</p> <p>Possess: skills in collecting and analyzing information for the development of environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including standards for maximum permissible exposure at a low level</p> | 3                |
| INADEQUATE   | <p>Don't know: features of the development of the organization's environmental documentation in accordance with the established requirements in the field of environmental protection, including the maximum permissible exposure standards</p> <p>Not be able to: develop environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including the standards of maximum permissible exposure</p> <p>Do not possess: skills in collecting and analyzing information for the development of environmental documentation of the organization in accordance with the established requirements in the field of environmental protection, including standards for maximum permissible exposure</p>                                   | 2                |
| ПК-9 Способен проектировать и создавать особо охраняемые природные территории, экологическое обустройство, экологические тропы, экологические сети и каркасы |  |                  |
| TALL   | <p>Know: theoretical foundations for the design and creation of specially protected natural areas, ecological development, ecological paths, ecological networks and frames.</p> <p>Be able to: design and create specially protected natural areas, ecological arrangement, ecological trails, ecological networks and frames</p> <p>Possess: skills in collecting and analyzing information for the design of specially protected natural areas, ecological development, ecological paths, ecological networks and frames</p>  | 5                |



| Level formation of competence  | Assessment "know", "be able", "own"  | Scale evaluating |
|--|--|------------------|
| BASE   | <p>Know: partially theoretical foundations for the design and creation of specially protected natural areas, ecological development, ecological paths, ecological networks and frames.</p> <p>Be able to: design and create specially protected natural areas, ecological arrangement, ecological trails, ecological networks and frameworks with minor errors</p> <p>Possess: skills in collecting and analyzing information for the design of specially protected natural areas, ecological development, ecological paths, ecological networks and frames at an intermediate level</p>   | 4                |
| THRESHOLD  | <p>Know: superficially theoretical foundations for the design and creation of specially protected natural areas, ecological development, ecological paths, ecological networks and frames.</p> <p>Be able to: design and create specially protected natural areas, ecological arrangement, ecological trails, ecological networks and frames with gross errors</p> <p>Possess: skills in collecting and analyzing information for the design of specially protected natural areas, ecological development, ecological paths, ecological networks and frames at a low level</p>   | 3                |
| INADEQUATE   | <p>Don't know: theoretical foundations for the design and creation of specially protected natural areas, ecological development, ecological paths, ecological networks and frames.</p> <p>Not be able to: design and create specially protected natural areas, ecological arrangement, ecological trails, ecological networks and frames</p> <p>Not possess: skills in collecting and analyzing information for the design of specially protected natural areas, ecological development, ecological paths, ecological networks and frames</p>  | 2                |
| ПК-10 Способен разрабатывать и внедрять мероприятия, направленные на выполнение требований в области охраны окружающей среды, внедрению системы экологического менеджмента, разработке и функционировании системы экологического мониторинга, предупреждения возникновения чрезвычайных ситуаций природного и техногенного характера |  |                  |
| TALL   | <p>Know: the theoretical foundations of measures aimed at meeting the requirements in the field of environmental protection, environmental management systems, environmental monitoring systems, natural and man-made emergencies</p> <p>Be able to: develop and implement measures aimed at meeting the requirements in the field of environmental protection, the introduction of an environmental management system, the development and operation of an environmental monitoring system, prevention of natural and man-made emergencies</p> <p>Possess: skills in the development and implementation of measures to meet the requirements in the field of environmental protection, the implementation of an environmental management system, the development and operation of an environmental monitoring system, prevention of natural and man-made emergencies</p>                              | 5                |
| BASE   | <p>Know: partially theoretical foundations of measures aimed at meeting the requirements in the field of environmental protection, environmental management systems, environmental monitoring systems, natural and man-made emergencies</p> <p>Be able to: develop and implement measures aimed at meeting the requirements in the field of environmental protection, introducing an environmental management system, developing and operating an environmental monitoring system, preventing natural and man-made emergencies with minor errors</p> <p>Possess: skills in the development and implementation of measures to meet the requirements in the field of environmental protection, the implementation of an environmental management system, the development and operation of an environmental monitoring system, the prevention of natural and man-made emergencies at the middle level</p> | 4                |
| THRESHOLD  | Know: superficially theoretical foundations of measures aimed at   | 3                |

| Level formation of competence | Assessment "know", "be able", "own"   | Scale evaluating |
|-------------------------------|---|------------------|
|                               | <p>meeting the requirements in the field of environmental protection, environmental management systems, environmental monitoring systems, natural and man-made emergencies</p> <p>Be able to: develop and implement measures aimed at meeting the requirements in the field of environmental protection, the implementation of an environmental management system, the development and operation of an environmental monitoring system, prevention of natural and man-made emergencies with gross errors</p> <p>Possess: skills in the development and implementation of measures to meet the requirements in the field of environmental protection, the implementation of an environmental management system, the development and operation of an environmental monitoring system, the prevention of natural and man-made emergencies at a low level</p> |                  |
| INADEQUATE                    | <p>Don't know: theoretical foundations of measures aimed at meeting the requirements in the field of environmental protection, environmental management systems, environmental monitoring systems, natural and man-made emergencies</p> <p>Not be able to: develop and implement measures aimed at meeting environmental requirements, introducing an environmental management system, developing and operating an environmental monitoring system, preventing natural and man-made emergencies</p> <p>Not possess: skills in the development and implementation of measures to meet the requirements in the field of environmental protection, the implementation of an environmental management system, the development and operation of an environmental monitoring system, prevention of emergencies of natural and man-made nature</p>               | 2                |

#### 4. PLACE OF STATE FINAL CERTIFICATION IN THE STRUCTURE OF OP

State final certification refers to block (B.3) "State final certification"

Preceding (supporting) disciplines, practices:

Life safety

Foreign Language (English) [Basic Level]

History

Logic

General theory of systems

Basics of project activity

Applied physical culture

Financial literacy

Philosophy

Sociology

Physical culture

Geography

Geoinformatics

Geology

Informatics

Geocological base of natural resource management

Mathematics

Fundamentals of Biology and Ecology

Soil science

Study of geospheres

Physics

Chemistry

Economy of natural resource management

Experimental methods in ecology

Digital geography in industry 4.0

Introduction in specialization

Environment and New Energetics

Urboecology

Basics of wind power

Basics of solar power

Nature conservation

Basics of energetic of water and internal parts of the Earth

Geochemistry of Environment

Geoinformational technologies in ecological engineering

Rate setting of atmospheric pollution

Rate setting of wastes

Rate setting of water pollution

Biological research methods in environmental engineering

Physico-chemical research methods in environmental engineering

Technogenic systems and ecological risks

Ecological projection and expertise

Ecological monitoring

Law fundamentals of natural resource management and environmental conservation

Academic practice in Nature conservation

Academic practice in Urboecology

Group project work [natural resource management]

Professional internship aimed at acquiring professional skills and experience in the vocational sphere

Research work [natural resource management]

Undergraduate practice

State final certification is carried out in the 4th year in the 12th trimester for full-time education.

## **5. METHODOLOGICAL MATERIALS DEFINING PROCEDURES FOR EVALUATING THE RESULTS OF THE LEARNING OF THE EDUCATIONAL PROGRAM**

### **5.1. State exam**

The state exam is the first attestation test of the state final attestation of students in the direction of training 05.03.06 Ecology and nature management, profile " Ecological Engineering and New Energetics".

#### **5.1.1. List of topics for preparing for the state exam**

### **INTRODUCTION IN SPECIALIZATION**

Ecology and nature management. History, composition, and structure. Classical and engineering ecology. The relation of concepts. Geoecology. Composition and structure. Environmental management. Composition and structure. The concept and classification of natural resources. Principles of rational use of natural resources. The concept of "environmental engineering". The concept of alternative energy sources. The biosphere and its basic properties. Understanding the boundaries of the biosphere. Using the energy of living matter. Characteristics of the lithosphere. Characteristics of the pedosphere. Fundamentals of the use of energy from the Earth's interior. Characteristics of the atmosphere. Fundamentals of solar energy. Fundamentals of wind energy. Hydrosphere and its features. Fundamentals of water energy use. The concept of ecosystems. The concept of biogeocenosis. Relationship with the concept of ecosystem. Ecosystem properties. Components of the ecosystem. The concepts of "biological species" and "population". Their ratio. Environmental factors and their classification. Types of biotic factors. Abiotic factors. Types of anthropic factors. Sources of atmospheric pollution. Sources of water pollution. Sources of soil pollution. Physical pollution of the environment and its consequences. Chemical pollution and its consequences. Biological pollution of the environment and its consequences. Conceptual framework for impact rationing. MPC, MPV, MPD and other regulatory indicators of pollution. Technological, economic, legal, social, territorial methods of reducing the negative impact. Physico-chemical methods in environmental engineering. Biological methods in environmental engineering. Environmental design. The concept of environmental crises and revolutions. Ecological crises and revolutions before the XX century. Current trends in environmental change. Forecasts of environmental changes. Reports of the Club of Rome. Sustainable development (eco-development): goals and objectives.

### **ENVIRONMENT AND NEW ENERGETICS**

The place of renewable energy sources (RES) in the classification of natural resources. The main types of RES. Trends in the development of global energy, investments in non-traditional energy. Green economy and renewable energy. The history of the modern RES market. The state of the global renewable energy market. The potential of wind energy and the possibilities of its use. History of wind energy use. Advantages and disadvantages of wind power. General characteristics of wind power plants (wind turbines). Types of wind turbines. The state and trends of the global wind energy market. The state and prospects of the wind energy market in Russia. Characteristics of solar radiation as an energy resource. Solar energy

converters and solar light concentrates. Advantages and disadvantages of solar energy. The state and trends of the global solar energy market. State and prospects of the solar energy market in Russia. Biofuels. Biofuels of "rural" and "urban" origin. Classification of biofuel production processes. The state and prospects of bioenergy abroad and in Russia. Advantages and disadvantages of bioenergy. State and trends of the world market of biogas and biofuels. State and prospects of the biogas and biofuel market in Russia. Thermal regime of the earth's crust. Sources of geothermal heat. Classification of geothermal areas. Methods and methods of using geothermal heat for electricity generation and in heat supply systems. Geothermal power plants (GeoES) of Russia. Environmental indicators of geoelectric power plants. Energy resources of the ocean. The energy of sea currents. General characteristics of a tidal wave. Power plants that use tidal water rise and tidal currents (PES). The main regulatory and legal acts in the field of renewable energy in Russia. World experience of state support of renewable energy sources. State and prospects of alternative energy development in the EU State and prospects of alternative energy development in the BRICS countries State and prospects of alternative energy development in Japan State and prospects of alternative energy development in New Zealand The state and prospects of alternative energy development in China.

### **BASICS OF ENERGETIC OF WATER AND INTERNAL PARTS OF THE EARTH**

Define the "bowels of the Earth", explain the structure of the Earth. To reveal the concept of geothermal energy. Give examples of the use of geothermal energy. Pros and cons of geothermal energy. Regulatory legal acts in the field of geothermal energy use. Define and characterize the hydrosphere. Define and characterize hydropower. Use of hydropower in industry. Use of hydropower in different regions of the world. Pros and cons of hydropower. Prerequisites for the use of hydropower. Define the tides. Their characteristics. Explain the energy of sea waves. Use of marine wave energy in industry. Use of wave energy in different regions of the world. Alternative energy sources. Regulatory and legal acts in the field of hydropower. Regulatory legal acts in the field of wave energy use.

### **GEOINFORMATIONAL TECHNOLOGIES IN ECOLOGICAL ENGINEERING**

Raster graphics: definition, advantages and disadvantages, basic formats. Vector graphics: definition, advantages and disadvantages, basic formats. Levels of state forest management in Russia, state authorities and organizations. Types of maps in forestry: tablet (content, scale, purpose, application features). Types of maps in forestry: forest management map (content, scale, purpose, application features). Types of maps in forestry: map of forestry (content, scale, purpose, application features). Types of overview forest maps at the regional and federal levels (content, scale, purpose, application features). Use of aerial photography in forestry. Characteristics of the use of GIS for the preparation of field work (search and processing of spatial information + determination of optimal casting paths). Characteristics of the use of GIS for the preparation of field work (Determination of sampling sites (survey sites) and survey routes + determination of the primary parameters of the surveyed objects). Characteristics of the use of GIS in field work (GIS as a field orientation system + Recording of primary survey data).

Characteristics of the use of GIS to create a GIS database of the studied objects (Inventory of the collected information + Analysis of the state of the environment). Characteristics of the use of GIS to create a GIS database of the objects under study (Preparation of requests to public authorities). Characteristics of the use of GIS for the creation of environmental research reports (Definition of coordinates + Description of boundaries). Characteristics of the use of GIS for the creation of environmental research reports (Creation of maps + Development of recommendations). Electromagnetic radiation: propagation velocity, electromagnetic wave model, wavelength, wave oscillation frequency, emissivity of bodies. The spectrum of electromagnetic radiation. Ranges of wavelengths: ultraviolet, optical (visible), near-infrared, mid-infrared, thermal infrared parts of the spectrum. Interaction of electromagnetic radiation

with the atmosphere. The main types of interaction. The absorption of electromagnetic radiation by the atmosphere. "Windows" of atmospheric transparency. Curves of the reflectivity of bodies. The concept of body reflectivity. The reflectivity curve of green plants. Soil and natural water reflectivity curves.

## **RATE SETTING OF ATMOSPHERIC POLLUTION**

Anthropogenic impact on atmospheric air and measures to regulate it Regulation of emissions as one of the methods of reducing the anthropogenic load on ecosystems. International normative legal acts in the field of atmospheric air protection. International agreements on the reduction of emissions of sulfur dioxide, nitrogen oxides, volatile organic compounds (VOCs). Technological standards. Best available technologies. Technical standards. Permissible exposure standards. Sanitary and hygienic standards. Types of effects on atmospheric air. Natural sources of exposure to atmospheric air. Receipts from space. Natural sources of exposure to atmospheric air. Volcanic processes. Natural sources of exposure to atmospheric air. Wind erosion. Natural sources of exposure to atmospheric air. Biological processes. Chemical effects on atmospheric air in various industries. Sources of release of pollutants, sources of emissions of pollutants. Classification of emission sources. Impact of motor transport on atmospheric air. Physical impact on atmospheric air. Noise exposure, noise sources. Physical impact on atmospheric air. Vibration. Electromagnetic, ionizing radiation. Inventory of stationary sources of emissions and pollutants into the atmospheric air. Carcinogenic properties of pollutants. Influence of physical factors (noise, vibration, electromagnetic, ionizing radiation) on atmospheric air and human health Methods for reducing the impact of pollutants on the atmospheric air. Gas cleaning equipment. Methods and means of combating noise and electromagnetic radiation. The impact of thermal energy enterprises on the atmospheric air. Impact of wastewater treatment plants on atmospheric air. Impact of mining enterprises on atmospheric air. Impact of agriculture on atmospheric air. Composition of emissions of pollutants at thermal power plants. Composition of pollutant emissions from wastewater treatment plants. Composition of pollutant emissions at mining enterprises. Composition of emissions of pollutants at agricultural enterprises.

## **RATE SETTING OF WASTES**

Production and consumption waste. Anthropogenic contribution to waste generation and management measures. Rationing of waste generation and disposal as one of the methods of reducing the anthropogenic load on ecosystems. Regulatory legal acts in the field of waste management: international legal acts in the field of waste management, state standards (GOST), building codes and regulations( SNiP), federal laws. Types of waste generated as a result of economic activity. Hazardous waste generated in various industries. Solid municipal waste. Approaches to the classification of hazardous waste. Sanitary classification and environmental classification. Waste hazard classes. Categories of hazardous waste. Hazardous properties of waste. Waste composition. Methods of handling hazardous waste. Rules for handling hazardous waste. Requirements for waste storage sites and their transportation. Waste disposal. MSW landfills, landfills. Waste disposal facilities. Disposal of hazardous waste. Biothermal methods of hazardous waste disposal. Disposal of hazardous waste. Composting. Disposal of hazardous waste. Thermal methods of hazardous waste disposal. Disposal of hazardous waste. Waste incinerators. Disposal of hazardous waste. Chemical methods of hazardous waste disposal. Disposal of hazardous waste. Physical methods of hazardous waste disposal. Mechanical methods of hazardous waste disposal. Impact on the environmental components of waste disposal facilities (landfills. landfills). Environmental impact of waste disposal facilities. Impact of incinerators on environmental components. Reducing the negative impact on environmental components from waste disposal facilities. Reducing the negative impact on environmental components from thermal waste disposal facilities. Reducing the use of plastic in the world. Sorting of municipal solid waste. Recycling and use of waste as secondary resources.

## **RATE SETTING OF WATER POLLUTION**

Basic terms and concepts. Define water resources, their characteristics. describe water resources by region of the world. Seas as part of water resources. Surface water. Underground water. glaciers and snowfields. Sources of pollution of the seas and oceans. Sources of surface water pollution. Sources of groundwater pollution. Impact on glaciers and snowfields. Main pollutants of water resources. Heavy metals and their effects. Biological water pollution. Regulatory framework. International law. Waste water.

## **TECHNOGENIC SYSTEMS AND ECOLOGICAL RISKS**

Ecosystem concept. Formulate the principles of ecosystem functioning. Resistance of ecosystems to anthropogenic impact. The main differences between technogenic ecosystems from natural ones. Correlation of the principles of ecosystem functioning with the laws of thermodynamics. The history of the development of a systematic approach. The main methods of the systems approach. A systematic approach to the analysis of natural and anthropogenic events and the study of ecosystems. Definition of a technogenic ecosystem. Quasi-stationary and dynamic state of the technogenic ecosystem. Man-made ecosystems damaged ecosystems. Definition of PTGS. The structure and boundaries of the OTC. Direction of technogenic impact on the natural component. 4 groups of impact direction. Man-made badlands. Anthropoecosystems. Anthropoecosphere. City as an example of an anthropoecosystem. Ecosystem signs of the city. Reflection of the problems of preservation and sustainable development of the environment in the legislative documents of the Russian Federation (forest and water codes, environmental doctrine, etc.). The largest and most dangerous technogenic impact on the environment. Major environmental pollutants. Their classification. The classification of planned environmental impacts facilitates environmental planning. Differences between the concepts of technogenic load and technogenic impact. Technogenic impact assessment methods: additivity, synergism and antagonism. The ecological consequences of technogenesis is a complex scientific and methodological problem. Technogenic ranks. Examples. Consequences of the growth of the tephnosphere for the natural environment. Methodology for assessing the risk to human health, characteristics of the stages. A concrete example of risk assessment. Short-term and long-term scientific and methodological tasks in the field of risk assessment. Comparison of the traditional methodology of hygienic regulation and hygienic diagnostics (risk assessment). Systematic risk assessment. MPC, varieties, advantages and disadvantages of use. Quantitative and qualitative criteria for regional risk assessment. The purpose of the regional risk assessment. Its advantages over other methods of environmental control. Definition of concepts: environmental diagnostics, environmental regulation, environmental forecast. Laboratory biotesting. Organisms as test objects. Bioindication approach for assessing the state of natural ecosystems. Determination of the main indices for assessing the state of water bodies. The main ways of folding information about biota (analysis of rank distributions, desirability function method, benchmarking, indicators of the efficiency of biota functioning, integrated assessments of ecosystem well-being). Modern concepts of environmental regulation: biotic approach, analysis of the dose-effect relationship, determination of environmentally permissible levels (EDL) of disturbing influences. The main natural hazards in Russia, give their classification and development trends. The main natural hazards in the world, give their classification and development trends. Technical accidents and disasters. Emergency. The main quantitative indicators of emergency situations. Immediate and remote consequences of emergency situations. Indicators (1) safety, (2) reliability of technical systems. The environmental performance of the enterprise is assessed in the process of environmental audit. Classification of types of technogenic risk by object of risk. The type of risk is fundamental. Sequential scheme for assessing technogenic risk. Global environmental problems, the relationship between the level of environmental safety and economic opportunities of society. Basic strategies for solving global environmental problems. Sustainable development concept. Describe the environmental problems of modern Russia and possible ways to solve them.

Systemic threats to the environmental safety of Russia. International organizations deal with problems of ecology and sustainable development. Mechanism for international environmental cooperation. Economic (1) and regulatory (2) mechanisms of environmental risk management. The main ways and methods to reduce environmental risk. Greening production. Solid waste, their composition, accumulation dynamics. Chemical and biochemical treatment of solid waste, burial. Installation of solid waste landfills. The main problems of solid waste landfills. Processing of liquid-phase waste. Biological wastewater treatment system. The types of chemical processes underlie it. Biosafety and Bioterrorism Issues. Three generations of biological weapons. BW risk and bioterrorism.

## **ECOLOGICAL MONITORING**

Scientific foundations of environmental monitoring. Purpose and main objectives of environmental monitoring. Environmental observations. The main tasks of the observation system. Environmental assessment. Environmental standards for assessing the quality of the natural environment. Environmental standards and regulations. Environmental forecast and modeling. Development of the forecast. Normative environmental forecasting. Global monitoring. Climate monitoring. Priority pollutants. National monitoring. Regional monitoring. Goals and objectives of monitoring anthropogenic sources of influence. Impact monitoring. Ecological and geographical assessment of the natural environment. Hierarchical organization of the region. Principles of assessing the ecological state of the territory. Assessment of the state of the parameters of terrestrial ecosystems. Assessment of phytomass stocks, productivity, age, and heterotrophic capacity of terrestrial ecosystems. Fundamentals of atmospheric monitoring. Atmospheric air quality. Fundamentals of water monitoring. Observations in hydrological monitoring. Observation programs for hydrobiological indicators. Water quality regulation. Soil and land monitoring. Source materials for the organization of soil monitoring. Soil degradation. Chemical pollution of land. Local monitoring. Selection of locations for initial assessment or sampling in local monitoring. Sampling of natural objects. Botanical monitoring. Basic principles of botanical monitoring. The concept of potential natural vegetation. Restored, climax vegetation. Protection of the gene pool and the cenofund. Vegetation maps. Assessment and forecast of anthropogenic vegetation degradation. Biological monitoring. Methods for assessing the state and dynamics of biosystems. Zoological monitoring. Fundamentals of the legislation of the Russian Federation in the field of environmental monitoring. Environmental management and monitoring. Local environmental monitoring. The procedure for developing the analytical program and technological regulations for monitoring. Ensuring the reliability of analytical monitoring data. Environmental information in the monitoring system. Internal audit of the environmental monitoring system.

### **5.1.2. State examination procedure**

The state exam is conducted according to a program approved by the organization, which contains a list of questions to be submitted for the state exam and recommendations for students on preparing for the state exam, including a list of recommended literature for preparing for the state exam.

Before the state exam, students are consulted on the issues included in the state exam program (hereinafter - pre-examination consultation).

Not later than 30 calendar days before the day of the first state certification test, the organization approves by an administrative act the schedule of state certification tests (hereinafter - the schedule), which indicates the dates, time and place of the state certification tests and pre-examination consultations, and brings the schedule to the attention of the student, members of state examination commissions and appeal commissions, secretaries of state examination commissions, managers and consultants of final qualifying works.



When forming the schedule, a break is established between state certification tests lasting at least 7 calendar days.

By the beginning of the state exam, the audience should be prepared:

- order on the composition of the State Examination Commission (SEC);
- information about graduates admitted to the defense;
- HEC protocols.

The examiner is given no more than 60 minutes to prepare, about which he is warned in advance. After the allotted time, the student is invited to take the exam.

The state exam is taken orally. The content of all questions of the ticket is disclosed sequentially. Each examinee receives one ticket at the beginning of the state exam. After answering the questions of the ticket, members of the State Examination Commission (hereinafter referred to as the SEC) can ask additional questions, both to clarify the answers to the ticket questions, and in general on the content of the main educational program.

Students and persons involved in the state final certification, during its conduct, are prohibited from having and using communication means.

It is allowed to go out during the state exam only in exceptional cases, and only with the consent of the members of the State Electoral Commission for no more than 10 minutes, after having handed over your ticket and notes to the members of the commission.

If, when preparing the answer for the state exam, the examiner used reference materials and communication facilities not permitted by the state exam program, the GEC members decide to remove the student from the exam with the further entry of the "Deleted" entry into the GEC protocol.

After the end of the answer, the examination sheets are handed over to the secretary of the examination committee. Examination sheets are kept in the student's personal file.

For each examiner, the state examination protocol is filled out, in which the questions of the ticket and additional questions of the members of the commission are entered. The minutes of the state exam are signed by all members of the commission present. The final grade is entered into the protocol and the student's record book, confirmed by the signature of the chairman of the SEC and all members of the SEC present at the meeting.

The results of the state exam are announced to the student on the day of the exam after the minutes of the meeting of the commission are drawn up.

For passing the state exam - an audience equipped with presentation equipment (projector, screen, laptop) with appropriate software, chalk (s) or marker board.

### **5.1.3. Methodological recommendations for assessing the state examination by members of the State Examination Commission**

The purpose of the state exam is to determine the conformity of the results of mastering the program by the graduates in the direction of training 05.03.06 Ecology and nature management, the profile " Ecological Engineering and New Energetics".

The commission marks out the answers to the state exam at a closed meeting. The examiner's level of knowledge is assessed on:

- "excellent" Demonstrated deep, comprehensive knowledge of the material of the main educational program, corresponding to the requirements of competencies in the direction (profile) of training, understanding of the essence and relationship of the processes and phenomena under consideration, logically consistent, correct, complete answers to all questions of the examination card and additional questions are given.
- "good" Demonstrated solid and fairly complete knowledge of the material of the main educational program, corresponding to the requirements of competencies in the direction (profile) of training, a correct understanding of the essence of the relationship of the processes and phenomena under consideration, consistent, correct answers to the questions posed were given, single insignificant inaccuracies were made.

- "Satisfactory" Demonstrated knowledge and understanding of the basic questions of the main educational program, given essentially correct answers to all questions of the examination card, without gross errors, significant inaccuracies were made in the answers to certain questions.
- "unsatisfactory" No answer was given, or incorrect answers were given to one of the questions on the examination card, a lack of understanding of the essence of the proposed questions was demonstrated, gross errors were made in answering the questions.

## **5.2. Final qualifying work**

The final qualification work is the last attestation test of the state final attestation of students in the direction of training 05.03.06 Ecology and nature management, profile "Ecological Engineering and New Energetics".

### **5.2.1. Methodological guidelines for preparation for Graduation qualification work**

Graduation qualification work is an important stage of the educational process aimed at training highly qualified specialists. The implementation of the FQP is a comprehensive test of the preparation of the student for practical activities, as well as the most important form of implementation of the skills of creative, independent work of the student acquired in the learning process. FQP protection is one of the types of attestation tests provided by the SFA.

FQP is a complex, independent work of a student, the main goal and content of which is a comprehensive analysis, research or development on one of the issues of a theoretical or practical nature, corresponding to the direction of training.

The purpose of the FQP is not only to consolidate the knowledge acquired during the period of study, but also to expand, supplement the knowledge acquired at the university in general theoretical and special disciplines, as well as to develop the necessary skills for independent scientific work.

The FQP shows: the level of fundamental and special training of the student; his ability to analyze and generalize information in the field of environmental management, environmental assessment and environmental safety; acquired skills in solving urgent practical problems in the field of ecology and nature management. For this purpose, the GRADUATION QUALIFICATION WORK is required to show possession of modern technologies, as well as the ability to systematize and use the necessary information.

During the preparation of the following tasks are solved:

- independent research of topical issues of professional activity;
- systematization, consolidation and expansion of theoretical knowledge in special disciplines;
- deepening the skills of conducting students' independent research work, working with various reference and special literature;
- mastering the research methodology in solving problems developed in the GRADUATION QUALIFICATION WORK ;
- study and use of modern technologies in the field of ecology and nature management.

When performing FQP, the student demonstrates his ability and ability, relying on the knowledge gained, skills and formed general cultural, general professional and professional competencies, independently solve the problems of his professional activity at the modern level, professionally present special information, scientifically argue and defend his point of view.

The FQP should contain: rationale for the choice of the research topic, analysis of the elaboration of this issue in domestic and foreign scientific literature, setting the goal and objectives of the research. The GRADUATION QUALIFICATION WORK provides a consistent and detailed presentation of the results obtained and on their basis, clear conclusions are formulated. In the conclusion of the GRADUATION QUALIFICATION WORK , a list of used literature should be presented. If necessary, additional materials (graphs, tables, etc.) can be

included in the GRADUATION QUALIFICATION WORK , which are issued in the form of attachments.

FQP is allowed to be defended only after its preliminary approval by the head of the graduating department in the presence of a positive response from the head. The defense of the FQP is carried out at a meeting of the State Examination Commission. The results of the defense of the FQP are the basis for the SEC to make a decision on the assignment of the appropriate qualification (degree) and the issuance of a state-recognized diploma.

### **5.2.2. Requirements for the registration of the final qualifying work**

The final qualifying work must comply with the Guidelines for the preparation of term and final qualifying works for bachelors and masters of the Department of Biogeocenology and Environmental Protection of the Faculty of Geography of Perm State National Research University, approved by the head of the department.

The issued FQP must be assessed for borrowings using the AntiplaSFAt system. If plaSFARism is not eliminated after checking the work or the student's inability for various reasons to eliminate plaSFARism within the timeframe established by the regulation, the work is not allowed for protection, it must be processed.

### **5.2.3. GRADUATION QUALIFICATION WORK protection procedure**

The final qualifying work is a work performed by a student (several students together), demonstrating the level of preparedness of a graduate for independent professional activity.

The type of final qualifying work, the requirements for it, the procedure for its implementation and the criteria for its assessment are established by the organization independently.

The organization approves the list of topics of graduation qualification works offered to students (hereinafter referred to as the list of topics), and brings it to the attention of students no later than 6 months before the start date of the state final certification.

Upon the written application of the student (several students performing the final qualifying work together), the organization can, in the manner established by it, provide the student (students) with the opportunity to prepare and defend the final qualifying work on the topic proposed by the student (students), if it is reasonable to develop it for practical use. in the relevant field of professional activity or at a specific object of professional activity.

To prepare the final qualifying work for the student (several students performing the final qualifying work together), the executive act of the organization assigns the head of the final qualifying work from among the employees of the organization and, if necessary, a consultant (consultants).

Not later than 30 calendar days before the day of the first state certification test, the organization approves by an administrative act the schedule of state certification tests (hereinafter - the schedule), which indicates the dates, time and place of the state certification tests and pre-examination consultations, and brings the schedule to the attention of the student , members of state examination commissions and appeal commissions, secretaries of state examination commissions, managers and consultants of final qualifying works.

When forming the schedule, a break is established between state certification tests lasting at least 7 calendar days.

After the completion of the preparation of the final qualifying work for the student, the head of the final qualifying work submits to the organization a written review of the student's work during the preparation of the final qualifying work (hereinafter referred to as the review). In the case of the completion of the final qualifying work by several students, the head of the final qualifying work submits to the organization a review of their joint work during the preparation of the final qualifying work.

The organization ensures that the student is familiarized with the review no later than 5 calendar days before the day of defense of the final qualifying work.

The final qualifying work, feedback is submitted to the state examination commission no later than 2 calendar days before the day of defense of the final qualifying work.

In preparation for the defense of the FQP, the student needs to draw up abstracts or a synopsis of his speech, coordinate it with his supervisor.

To protect the provisions considered in the work, justify the conclusions, if necessary, you can prepare visual materials: tables, graphs, diagrams and refer to them during the defense. It is advisable to type visual materials on a computer and present at the defense for each member of the GEC.

The University has established a unified procedure for the protection of graduate qualification works. The auditorium for the defense must be equipped with multimedia equipment to demonstrate an electronic presentation.

The texts of the final qualifying works, with the exception of the texts of the final qualifying works, containing information constituting a state secret, are posted by the organization in the electronic library system of the organization and are checked for the amount of borrowing. The procedure for placing the texts of final qualifying works in the electronic library system of the organization, checking for the amount of borrowing, including meaningful, identifying unauthorized borrowing is established by the organization.

Access of persons to the texts of final qualifying works must be ensured in accordance with the legislation of the Russian Federation, taking into account the seizure of production, technical, economic, organizational and other information, including the results of intellectual activity in the scientific and technical sphere, on the ways of carrying out professional activities, which have actual or potential commercial value due to their unknown to third parties, in accordance with the decision of the copyright holder.

By the beginning of the defense of the FQP, the audience should be prepared:

- order on the composition of the State Examination Commission (SEC);
- information about graduates admitted to the defense;
- HEC protocols.

According to this procedure, the defense of the final qualifying work is carried out at an open meeting of the SEC, the composition of which is approved is the rector of the university. Protection is carried out by each student individually at open meetings of the SEC with the participation of at least two-thirds of its composition, as a rule, with the direct participation of the head of work.

The defense takes place publicly, therefore, in addition to the students, the scientific adviser and the reviewer, other interested persons and guests may be present.

The protection procedure is as follows. The chairman of the GEC or its member introduces those present to the topic of the work and gives the floor to the student to speak. The student expounds the main provisions of his work, focusing the attention of those present on the conclusions and proposals. The report is delivered freely, in your own words, without reading the text, but only relying on its provisions. The presentation should substantiate the relevance of the topic, the novelty of the problems and conclusions under consideration, the degree of development of the topic, briefly outline the main content, conclusions and proposals with convincing arguments. It should be borne in mind that the student is given no more than 10 minutes to speak. After the speech, the student commission, as well as all those present, ask questions on the topic of the work presented for the defense.

The student answers the questions, as a rule, immediately after the report, but additional training is possible with the consent of the GEC. If necessary, the student can use the explanatory note of the GRADUATION QUALIFICATION WORK . After answering the questions, the floor is given to the scientific supervisor of the work (in the absence of him at the defense, the review and review are read out).

The GEC's decision on the FQP assessment is made at a closed meeting, taking into account the opinion of the scientific supervisor, the assessment given by the external reviewer, the content of the introductory speech, the graduate's outlook, his ability to speak publicly, defend his interests, the depth of answers to questions, customer reviews (on custom topics).

The result of the defense is determined by the grades “excellent”, “good”, “satisfactory”, “unsatisfactory” and is announced on the same day after the minutes of the meetings of the examination committee for the defense of final qualifying works are drawn up in the prescribed manner.

In cases where the defense of the FQP is recognized as unsatisfactory, according to the decision of the State Electoral Commission, the student is expelled from the Perm State National Research University and instead of a diploma receives a certificate of the disciplines listened to and passed according to the curriculum without qualification.

The GEC makes a decision whether the student can submit the same work for re-defense with revision determined by the commission, or is obliged to perform work on a new topic.

The decision of the GEC is recorded in the protocol.

The result of the defense of the final qualifying work and the decision to award the qualification to the graduate are made out in the record book and certified by the signatures of all members of the SEC who attended the meeting.

To protect the final qualifying work - an audience equipped with presentation equipment (projector, screen, laptop) with appropriate software, chalk (s) or marker board.

#### **5.2.4. Methodological recommendations for the assessment of FQP by the scientific advisor**

The completed FQP is submitted for review to the scientific advisor. The duties of the scientific supervisor of the FQP are as follows:

- assistance to the student in choosing the topic of the GRADUATION QUALIFICATION WORK and developing a plan for its implementation;
- assistance in choosing a research methodology and organizing the process of writing a work;
- consulting on the selection of regulations, literature, statistical and factual material;
- systematic control over the completeness and quality of the prepared chapters of the FQP in accordance with the developed plan and timely submission of work to the department;
- preparation of a written review of the work with an assessment of the quality of its performance in accordance with the requirements for it;
- Carrying out preparation and preliminary defense of FQP in order to identify the student's readiness for defense.
- taking part in the protection of GRADUATION QUALIFICATION WORK s and responsibility for the quality of the GRADUATION QUALIFICATION WORK s submitted for protection.

After receiving the final version of the GRADUATION QUALIFICATION WORK , the supervisor fills out a written feedback forum. In the response, the supervisor gives an analysis of the work done, notes the student's personal contribution to substantiating the conclusions and proposals, and shows the features of the study. The review ends with a conclusion about the possibility or impossibility of admitting this work to protection. Then the supervisor signs the FQP on the title page.

The size of the review should be from one to three pages of typewritten text.

#### **5.2.5. Methodological recommendations for the student's report on the topic of Graduation qualification work**

The defense of the FQP begins with a student's report on the topic of work. The duration of the report is from 10 minutes. In the report, first of all, it is necessary to substantiate the

relevance of the chosen topic, then it is necessary to clearly formulate the purpose of the research being carried out and tell about the work done directly by the author, focusing on the results obtained in the course of its implementation. The report should not present the theoretical aspects of the issue under consideration if they are not controversial. The student must express the main content of his work freely, without reading the written text.

It is recommended in the process of the report to use a previously prepared visual graphic material (tables, diagrams), illustrating the main provisions of the work. The amount of illustrative material is not limited.

#### **5.2.6. Methodological recommendations for the assessment of FQP by members of the State Examination Commission**

The defense of the FQP aims to assess the graduate's readiness for professional activity.

The criteria for evaluating the FQP for its defense at the State Electoral Commission should be:

- compliance of the content and design of the FQP with the established requirements;
- the degree of fulfillment by the graduate of the tasks received from the department for the development of specific issues of the FQP theme;
- the depth of development of the problems considered in the work, saturation with practical material;
- the significance of the conclusions and proposals made in the work and the degree of their validity;
- the maturity of the graduate's speech at the defense of the FQP: the logic of presenting his recommendations, the completeness of answers to the questions asked, the quality of answers to the comments of the reviewer and those present at the defense.

The Commission evaluates the defense of the GRADUATION QUALIFICATION WORK at a closed meeting. When giving an assessment, the commission is guided by the approximate criteria for assessing FQP:

- "excellent" is awarded for qualifying work, which is an independent and completed research, includes a theoretical section containing a deep analysis of the scientific problem and the current state of its study. The study was carried out on the basis of a sufficient source base, using current methodological approaches. The work has a positive review from the supervisor. When defending it, the graduate shows deep knowledge of the research topic, freely operates with research data, makes sound proposals, effectively uses new information technologies when presenting his report, convincingly illustrating the report with diagrams, diagrams, tables, graphs, confidently answers the questions posed.

- "good" is awarded for qualifying work, which is of a research nature, has a well-presented theoretical section, which presents a fairly detailed analysis and critical analysis of conceptual approaches and practical activities, a consistent presentation of the material with appropriate conclusions, but with insufficiently substantiated proposals. The work has a positive review from the supervisor. When defending it, the graduate shows knowledge of the issues of the research topic, operates with research data, makes suggestions on the research topic, during the report uses visual material (tables, graphs, diagrams, etc.), answers the questions posed without much difficulty;

- "satisfactory" is awarded for qualifying work, which contains a theoretical chapter, elements of research, is based on practical material, but there is no deep analysis of the scientific problem; the work shows the inconsistency of the presentation of the material; the proposals presented are not sufficiently substantiated. The manager's response contains comments on the content of the work. During the defense, the graduate shows uncertainty, shows poor knowledge of the issues of the topic, does not always give substantiated and comprehensive answers to the questions asked, makes significant mistakes;

- “unsatisfactory” is awarded for qualifying work that is not consistent, does not meet the requirements set out in the guidelines of the graduating departments. There are no conclusions in the work. There are significant remarks in the scientific advisor's review. When defending the work, the graduate finds it difficult to answer the questions posed, makes significant mistakes. Presentation materials and handouts have not been prepared for defense.

In case of a positive assessment, the State Electoral Commission makes a decision on awarding the student a qualification (degree) with the issuance of a diploma of graduation from Perm State National Research University.

The organization of the state final certification for people with disabilities and persons with disabilities is determined by the local normative act of the Perm State National Research University.

## **6. ESTIMATED FACILITIES OF STATE FINAL CERTIFICATION**

### **6.1. Typical control tasks, or other materials necessary to assess the results of mastering EP**

#### **State exam questions:**

1. Environmental factors and their classification.
2. Types of anthropic factors.
3. Physical pollution of the environment and its consequences.
4. MPC, MPE, MPD and other standard pollution indicators.
5. Biological methods in environmental engineering.
6. Sustainable development (eco-development): goals and objectives.
7. The concept of environmental crises and revolutions. Environmental crises and revolutions before the twentieth century.
8. Technological, economic, legal, social, territorial methods to reduce the negative impact.
9. Principles of rational use of natural resources.
10. Sources of soil pollution.
11. Classical and engineering ecology. Correlation of concepts.
12. Current trends in environmental change.
13. Trends in the development of world energy, investments in non-traditional energy. Green economy and renewable energy.
14. World experience of state support for renewable energy sources.
15. Geothermal power plants (GeoPP) in Russia. Environmental indicators of geo-power plants.
16. State and trends of the world wind energy market.
17. Energy resources of the ocean. Energy of sea currents. General characteristics of a tidal wave. Plant vigor using tidal rises and tidal currents (PES).
18. Methods of using geothermal heat for power generation and heating systems.
19. State and prospects of bioenergy abroad and in Russia. The advantages and disadvantages of bioenergy.
20. Place of renewable energy sources (RES) in the classification of natural resources. The main types of RES.
21. The main regulatory legal acts in the field of renewable energy in Russia.
22. Biofuels. Biofuels of "rural" and "urban" origin. Classification of biofuel production processes.
23. State and prospects of the solar energy market in Russia.
24. World experience of state support for renewable energy sources.
25. Give examples of the use of geothermal energy.
26. The use of hydropower in industry.
27. Pros and cons of hydropower.
28. Normative legal acts in the field of the use of geothermal energy.
29. Alternative energy sources
30. Using the energy of sea waves in industry.
31. Use of wave energy in different regions of the world.
32. Normative legal acts in the field of wave energy use.

33. Preconditions for the use of hydropower.
34. The use of hydropower in different regions of the world.
35. Explain the energy of sea waves.
36. Pros and cons of geothermal energy.
37. Levels of state forest management in Russia, government agencies and organizations.
38. Types of maps in forestry: forest management map (content, scale, purpose, application features).
39. Features of the use of GIS for the preparation of field work (search and processing of spatial information + determination of optimal casting trajectories)
40. Interaction of electromagnetic radiation with the atmosphere. The main types of interaction. Absorption of electromagnetic radiation from the atmosphere. "Windows" with atmospheric transparency.
41. Peculiarities of using GIS to create reports on environmental studies (Creation of maps + Development of recommendations)
42. Types of overview forest maps of the regional and federal levels (content, scale, purpose, application. Features).
43. Spectrum of electromagnetic radiation. Wavelength ranges: ultraviolet, optical (visible), near infrared, mid infrared, thermal infrared parts of the spectrum.
44. Characteristics of the use of GIS for generating reports on environmental studies (Determination of coordinates + Description of boundaries).
45. Characteristics of the use of GIS in field work (GIS as a field orientation system + Record of primary survey data)
46. Curves of the reflectivity of bodies. The concept of the reflectivity of the body. Reflectivity curve for green plants. Reflectivity curves of soil and natural water.
47. Types of maps in forestry: tablet (content, scale, purpose, application features).
48. Peculiarities of using GIS to create a GIS database of investigated objects (Preparation of inquiries to government bodies)
49. Composition of pollutant emissions from wastewater treatment plants.
50. Composition of pollutant emissions at thermal power plants.
51. Impact of agriculture on atmospheric air.
52. Methods and means of dealing with noise and electromagnetic radiation.
53. Influence of physical factors (noise, vibration, electromagnetic, ionizing radiation) on atmospheric air and human health.
54. Inventory of stationary sources of emissions and pollutants into the air.
55. Sources of emission of pollutants. Classification of emission sources.
56. Natural sources of exposure to atmospheric air. Wind erosion
57. Types of impact on atmospheric air.
58. Technological standards. Best available technology.
59. Regulation of emissions as one of the methods reduction of anthropogenic load on ecosystems.
60. Anthropogenic impact on atmospheric air and measures for its regulation.
61. Recycling and use of waste as secondary resources.
62. Reducing the negative impact on environmental components from thermal waste disposal facilities.
63. Impact of incinerators on environmental components.
64. Mechanical methods of disposal of hazardous waste.
65. Disposal of hazardous waste. Thermal methods of disposal of hazardous waste
66. Methods of handling hazardous waste. Rules for handling hazardous waste.
67. Approaches to the classification of hazardous waste. Sanitary classification and environmental classification
68. Types of waste generated as a result of economic activities. Hazardous waste from various industries.
69. Rationing of waste generation and disposal as one of the methods to reduce anthropogenic load on ecosystems.
70. Anthropogenic contribution to waste generation and measures for their disposal.
71. Reducing the use of plastic in the world
72. Impact of waste disposal companies on the environment.



73. Biological pollution of water
74. The main pollutants of water resources.
75. Sources of surface water pollution.
76. Describe water resources by region of the world
77. Determine the water resources, their characteristics.
78. Sources of pollution of the seas and oceans.
79. Sources of groundwater pollution.
80. Wastewater
81. Glaciers and snow fields.
82. Surface waters
83. Groundwater
84. The sea as part of water resources
85. The concept of the ecosystem. Formulate the principles of the ecosystem functioning.
86. The main methods of the systems approach. A systematic approach to the analysis of natural and anthropogenic phenomena and the study of ecosystems
87. Quasi-stationary and dynamic state of the technogenic ecosystem.
88. Reflection of the problems of conservation and sustainable development of the environment in the legislative documents of the Russian Federation (forest and water codes, environmental doctrine, etc.).
89. The main pollutants of the environment. Their classification.
90. Methods for assessing technogenic impact: additivity, synergy and antagonism.
91. Short-term and long-term scientific and methodological tasks in the field of risk assessment.
92. Quantitative and qualitative criteria for assessing regional risk. The purpose of assessing regional risk. Its advantages over other methods of environmental control.
93. Bioindication approach to assessing the state of natural ecosystems.
94. The main ways of folding information about biota (analysis of rank distributions, desirability function method, benchmarking, indicators of the efficiency of biota functioning, comprehensive assessments of ecosystem well-being).
95. Describe the environmental problems of modern Russia and possible ways to solve them.
96. Chemical and biochemical treatment of solid waste, burial. Installation of solid waste landfills.
97. Environmental information in the monitoring system.
98. The procedure for the development of an analytical program and technological regulations for monitoring.
99. Methods for assessing the state and dynamics of biosystems.
100. Assessment and forecast of degradation of anthropogenic vegetation
101. Selection of sites for initial assessment or sampling for local monitoring.
102. Monitoring of soils and lands. Initial materials for the organization of soil monitoring.
103. Basics of water monitoring.
104. Principles for assessing the ecological state of the territory.
105. Environmental standards for assessing the quality of the environment.
106. Scientific foundations of environmental monitoring.
107. Chemical pollution of land.
108. Observing programs for hydrobiological indicators.

**Approximate topics of final qualifying works:**

1. Impact of oil production enterprises on the environment ...
2. Actual problems of engineering and environmental surveys
3. Determination of the permissible content of oil and oil products in soils ...
4. Landscape and ecosystem studies during engineering and environmental surveys
5. Stray dogs as an element of the urban environment
6. Ecological and geographical outline ...
7. Impact of oil products on atmospheric air
8. Inventory of natural resources by means of GIS

### Sample questions asked during the public defense of the Graduation qualification

#### work:

1. Formulate the relevance of the Graduation qualification work.
2. Formulate the purpose of the Graduation qualification work.
3. Formulate the objectives of the study.
4. Determine the degree of elaboration of the problem.
5. What are the main sources of information about the state of the environment.
6. Substantiate your conclusions on the assessment of the degree of pollution of the atmosphere (or other natural resource).
7. List the factors of the impact of the activities of a particular enterprise on the environment.
8. What regulatory documents were used in assessing the impact of the enterprise on the environment.
9. List the methods of landscape research.
10. Formulate conclusions on the obtained research results.
11. List the recommendations for the practical implementation of the results.
12. Name the computer tools that you used in the research process.

### **6.2. Methodological materials defining procedures for assessing knowledge, abilities, skills and (or) experience of activities, characterizing the formation of competencies**

Evaluation tools include evaluation materials that are classified by type of control:

- intermediate certification, carried out by the teacher after studying the theoretical material of the academic discipline, passing the educational, industrial and pre-diploma practice;
- SFA conducted by HES.

Evaluation tools for SIA graduates include indicators and criteria for assessing the result of the state examination and the implementation and protection of FQP of the main parameters of the process or the result of activity, certified as components of universal, general professional and professional competencies. Performance indicators reflect an integrated performance result.

Evaluation tools for SIA provide a step-by-step and integral assessment of graduates' competencies.

The achievement of indicators for assessing the results of the state exam and defense of the FQP is assessed by the State Electoral Commission, taking into account the completeness of answers to the questions of the examination card, the relevance of the chosen topic, practical significance, performing level, as well as methodological and informational support. The criteria for assessing the results of the state exam and defense of the FQP are unambiguous and logical

Requirements for the content, volume and structure of FQP are determined by the Methodological Guidelines for the preparation of coursework and final qualifying works for bachelors and masters of the Department of Biogeocenology and Environmental Protection of the Faculty of Geography of Perm State National Research University.

The developed tasks for the FQP, the main indicators for assessing the results of the implementation and defense of the FQP and the evaluation criteria (evaluation tools of the SFA) undergo preliminary examination for compliance with the requirements and are approved at a meeting of the issuing department.

Assessment of the competencies of HEC graduates in stages, taking into account the assessments of: universal, general professional and professional competencies of graduates, demonstrated during the state exam and defense of FQP, taking into account the results of intermediate certification in academic disciplines.

Criteria for assessing the state exam:

- demonstration of deep, comprehensive knowledge of the material;

- understanding the essence and relationship of the processes and phenomena under consideration;
- answers to the main questions of the examination card;
- answers to additional answers of exam tickets;
- argumentation of answers to questions;
- clarity and consistency of oral speech;
- protection of their own professional positions.

Graduation qualification work evaluation criteria:

- understands the relevance and importance of the chosen topic;
- searches for and uses the information necessary for the effective performance of professional tasks;
- establishes a connection between theoretical and practical results and their compliance with the goals, objectives of the research;
- knows how to structure knowledge, solve complex practical problems;
- summarizes the research results, draws conclusions;
- logically builds up the defense, argues the answers to questions;
- defends his own professional position;
- carries out self-assessment of activities and results (awareness and generalization of their own level of professional development);
- submits work, drawn up in accordance with the basic requirements;
- accompanies the defense with a high-quality electronic presentation, corresponding to the structure and content of the GRADUATION QUALIFICATION WORK .

## **7. LIST OF BASIC AND ADDITIONAL EDUCATIONAL LITERATURE REQUIRED FOR SFA**

### **7.1. Main literature**

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## 7.2. Additional literature

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### 7.3. Internet resources

1. Network local resources (authorized access to work with full-text books and journals, databases, abstract and information resources). - Access mode: <http://library.psu.ru/>

2. Network remote resources:

- Electronic library system IPRbooks - Access mode: <http://www.iprbookshop.ru/> (access by login and password from any computer connected to the Internet);
- ELiS - electronic library - Access mode: <http://in.psu.ru/elis/> (access by login and password from any computer connected to the Internet);
- Electronic library system Znanium. - Access mode: <http://znanium.com> (access by login and password from any computer connected to the Internet);
- Library BiblioTech - Access mode: <https://psu.bibliotech.ru/> (access by login and password from any computer connected to the Internet);
- Scientific electronic library elibrary. - Access mode: <http://www.elibrary.ru> (access from any computer connected to the Internet);
- Springer Publishing Company - Access mode: <https://www.springer.com/gp> (accessible from any computer with an Internet connection).

- ProQuest - Access mode: <https://about.proquest.com/> (access from any computer connected to the Internet).
- Electronic library system IPRbooks - Access mode: <https://www.iprbookshop.ru/> (access from any computer connected to the Internet).
- Onlinelibrary.wiley - Access mode: <https://onlinelibrary.wiley.com/> (access from any computer connected to the Internet).