

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
higher education
NORTH CAUCASIAN FEDERAL UNIVERSITY

I APPROVE

Dean of the Faculty of Mathematics and
Computer Science named after Professor
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and Mathematical Sciences, Associate
Professor
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ASSESSMENT TOOLS FUND FOR DISCIPLINE

History and Philosophy of Science / История и философия науки

Direction of training	02.04.01 Mathematics and Computer Science
Profile	Artificial Intelligence in Cybersecurity
Year of commencement of studies	<u>2026</u>
Form of study	full-time
Implemented in 1 semester	

Introduction

1. Purpose: The assessment toolkit is designed to provide a methodological basis for organizing and conducting ongoing assessments in the course "History and Philosophy of Science / История и философия науки." Ongoing assessment in this course is a systematic method for assessing students' knowledge, skills, and abilities. The objectives of ongoing assessments are to obtain initial information on the progress and quality of competencies acquired, as well as to encourage regular, targeted student work. This work is intended to develop a certain level of competencies.

2. FOS is an appendix to the program of the discipline "History and Philosophy of Science / История и философия науки"

3. Developer: Department of Computational Mathematics and Cybernetics.

4. An examination of the organophosphorus compounds was carried out.

Members of the expert group:

Chairman

Babenko M. G., Head of the Department of Computational Mathematics and Cybernetics.

Members of the commission:

Peleshenko V.S., Associate Professor of the Department of Computational Mathematics and Cybernetics.

Peleshenko T. A., Associate Professor of the Department of Computational Mathematics and Cybernetics.

Representative of the employer organization Kornienko S. A., head of the branch department FSUE "Main Radio Frequency Center" in the Southern and North Caucasian Federal Districts districts

Expert opinion: the assessment tool fund complies with the educational program for the training program 02.04.01 Mathematics and Computer Science, profile "Artificial Intelligence in Cybersecurity" and is recommended for ongoing monitoring of academic performance and midterm assessment of students.

5. The validity period of the FOS is determined by the period of implementation of the educational program.

1. Description of the criteria for assessing competence at various stages of its development, description of assessment scales

Competence (ii), indicator (s)	Levels of development competence (s),			
	The minimum level has not been reached (Unsatisfactory) 2 points	Minimum level (satisfactorily) 3 points	Intermediate level (Fine) 4 points	High level (excellent) 5 points
<i>Competence: UK-1 Able to carry out a critical analysis of problematic situations based on a systems approach and develop an action strategy</i>				
Learning outcomes for the course (module): <i>Indicator:</i> <i>ID-1. UK-1.</i> Selects information resources to search for information in accordance with the assigned educational task.	Does not carry out choice informational resources for searching information in in accordance with delivered educational task	With difficulty it is carried out selection of information resources for searching information in in accordance with the set educational task	With disabilities, he is able to select information resources to search for information in accordance with the assigned educational task.	Makes a choice information resources to search for information in accordance with the assigned educational task task.
<i>ID-2. UK-1.</i> Systematizes information obtained from various sources in accordance with the requirements of the educational task	Doesn't systematize information, obtained from different sources, in accordance with requirements execution educational assignment	With difficulty systematizes information, obtained from different sources, in in accordance with requirements execution educational assignment.	With impairments, he is able to systematize information, obtained from various sources, in in accordance with demands execution educational assignment.	Systematizes information obtained from different sources, in accordance with the requirements of implementati on educational tasks.
<i>ID-3. UK-1.</i> Formulates and argues conclusions and judgments, including using philosophical conceptual apparatus	Does not formulate and argues conclusions and judgments, including with application philosophical conceptual apparatus	Has difficulty formulating and arguing conclusions and judgments, including using philosophical conceptual apparatus.	Formulates with violations and argues conclusions and judgments, in including the use of philosophical conceptual apparatus.	Formulates and argues conclusions and judgments , including the use of philosophical concepts apparatus.
<i>Competence: About PC- 1 Able to find, formulate and solve current and significant problems of applied and computer mathematics</i>				
Learning outcomes for the course (module): <i>Indicator:</i> <i>ID-10PK-1 Finds and formulates significant problems of applied and</i>	Doesn't conduct expert work in mathematics.	Has difficulty conducting expert work in mathematics	Conducts expert work on mathematics with errors	Conducts expert work in mathematics.

<i>computer mathematics</i>				
<i>ID-2_{OPK-1} knows and uses methods for solving significant problems of applied and computer mathematics</i>	Doesn't conduct expert work in the region computer science Doesn't cook methodological materials in areas of mathematics and computer science	Has difficulty conducting expert work in the field of computer science Cooks with difficulty methodological materials in areas mathematics and computer science	Conducts expert work in the field of computer science with errors Prepares teaching materials in the field of mathematics and computer science with errors	Conducts expert work in the field of computer science Prepares teaching materials in the fields of mathematics and computer science

The assessment of the level of development of competence in the discipline is carried out on the basis of the "Regulations on the current monitoring of academic performance and midterm assessment of students in higher education programs - bachelor's programs, specialist programs, master's programs - at the federal state autonomous educational institution of higher education "North Caucasus Federal University" in the current version.

ASSESSMENT TOOLS FOR CHECKING THE LEVEL OF DEVELOPMENT OF COMPETENCIES

Task number	Correct answer	Contents of the question	Competence
		Form of study: full-time/part-time/full-time and part-time	
1.	Science is a multifaceted phenomenon that can be viewed from various perspectives. Here are definitions of science in three aspects: as a form of cognitive activity, as a social institution, and as a distinct cultural sphere.	Provide a definition of science as a type of cognitive activity, a social institution and a special sphere of culture.	UK-1, OPK-1
2.	Scientific disciplines; scientific methods; scientific theories and laws; scientific communities and institutions; scientific publications and communication; education and training	Provide the structure of science.	UK-1, OPK-1
3.	Forms of knowledge: sensory, rational, intuitive, practical, theoretical. Criteria of scientificity: objectivity, systematicity, verifiability , falsifiability , validity, universality, development.	Provide forms of knowledge and criteria of scientificity.	UK-1, OPK-1
4.	Methodology, ontology, ethics, historical context, conceptual issues, interdisciplinary	Specify the connections between science and philosophy.	UK-1, OPK-1

	research.		
5.	Inspiration and creativity, technology, nature studies, interdisciplinary projects, aesthetics and perception.	Specify the connections between science and art.	UK-1, OPK-1
6.	Technology, health, ecology, psychology, education, safety.	Point out the connections between science and the everyday world.	UK-1, OPK-1
7.	Education and enlightenment, technological progress, art and creativity, social change, ethics and philosophy, global challenges.	Indicate the role of science in modern culture.	UK-1, OPK-1
8.	Scientific knowledge: objectivity and verifiability, methodology, technological development, education and enlightenment. Non-scientific knowledge: subjective experience, culture and art, ethics and morality, spiritual practices. Interconnection: dialogue, criticism and self-criticism, synergy.	Scientific and non-scientific knowledge in the system of spiritual culture.	UK-1, OPK-1
9.	Humanistic dimension: the value of human life,	Provide the humanistic dimension and social-ethical principles of scientific knowledge.	UK-1, OPK-1

	respect for the individual, inclusiveness, responsibility to future generations. Social and ethical principles: transparency, honesty and integrity, social responsibility, collaboration, research ethics.		
10.	Differentiation of scientific knowledge is the process of specialization and division of science into narrow disciplines, allowing for in-depth study of specific areas. Integration, on the other hand, involves combining knowledge from different disciplines to create a more holistic understanding of complex phenomena.	What is the differentiation and integration of scientific knowledge?	UK-1, OPK-1
11.	The problem of the beginnings of science lies in the difficulty of defining what exactly is considered science, in choosing appropriate research methods, in the historical context of its	What is the problem of the beginning of science?	UK-1, OPK-1

	development, as well as in philosophical questions about the nature of knowledge and truth.		
12.	Eurocentrism, in its understanding of the genesis of science, emphasizes European achievements and traditions, which can ignore the contributions of other cultures and civilizations to the development of science. Antihistoricism, in turn, denies the importance of historical context for understanding science, focusing instead on universal truths and principles.	Eurocentrism and anti-historicism in understanding the genesis of science.	UK-1, OPK-1
13.	Problems of periodization of the history of science: the difficulty of defining boundaries, cultural differences, interdisciplinarity. Types of periodization of the history of science: chronological, thematic, methodological.	Provide the problems of periodization of the history of science and its types.	UK-1, OPK-1

14.	Internalism in historical scientific research emphasizes the internal logic of scientific development, including the theories, methods, and ideas of scientists. Externalism, on the other hand, emphasizes the influence of external factors on the development of science, such as social, cultural, economic, and political conditions.	What is internalism and externalism in historical scientific research?	UK-1, OPK-1
15.	The problem of the genesis of science concerns how and why scientific knowledge and disciplines emerge. It examines the factors that contributed to the development of science in different historical periods, including social, cultural, economic, and political conditions.	Describe the problem of the genesis of science.	UK-1, OPK-1
16.	Cognitive, applied, critical, educational, social.	Provide the functions of science in modern culture.	UK-1, OPK-1
17.	Scientism is a worldview that asserts that science is	What is scientism and anti-scientism – ideological positions of the 20th century and their influence on the development of culture.	UK-1, OPK-1

	the primary or only source of true knowledge. Antiscientism , on the other hand, criticizes scientism, arguing that science cannot answer all questions, particularly in the areas of ethics, art, and philosophy.		
18.	Empiricism, rationalism, objectivity, universality of science, progress	Describe the philosophical foundations of scientism.	UK-1, OPK-1
19.	Development, data analysis, forecasting, policy evaluation, innovation.	Give the role of scientific research in economic knowledge	UK-1, OPK-1
20.	From scholasticism to empiricism, mechanistic approach, systems approach, interdisciplinarity , critical and post-classical thinking.	How did the change in styles of thinking manifest itself in the history of classical natural science?	UK-1, OPK-1
21.	Dynamism of knowledge, diversity of methods, systematicity, interdisciplinarity , critical thinking.	Provide the ideals and norms of non-classical natural science.	UK-1, OPK-1
22.	Determinism: Assumes that all events in the world are predetermined by previous conditions	Describe the relationship between determinism and indeterminism in the modern scientific picture of the world.	UK-1, OPK-1

	and laws of nature. Indeterminism: Indicates the presence of randomness and unpredictability in nature.		
23.	An example of environmental ethics as an imperative for human survival is the concept of sustainable development. It implies the need to balance economic growth with environmental protection to meet the needs of the present generation without compromising the opportunities of future generations.	Give an example of environmental ethics – an imperative for the survival of humanity.	UK-1, OPK-1
24.	Objectivity, empiricism, systematicity, criticality, openness.	What are the principles and ideals of modern science?	UK-1, OPK-1
25.	An example of the culture of the ancient polis is Ancient Greece, where city-states (polises) such as Athens became centers of philosophical thought and science. During this time, the first forms of theoretical science developed, for example,	Give an example of the culture of the ancient polis and the formation of the first forms of theoretical science.	UK-1, OPK-1

	the works of philosophers such as Pythagoras and Aristotle, who laid the foundations of mathematics, physics, and biology.		
26.	During the Middle Ages, natural science was often based on scholasticism and religious texts. One example is the work of Thomas Aquinas, who attempted to combine Christian theology with Aristotelian philosophy. Key traditions included the systematization of knowledge, empiricism, and alchemy.	Give an example of the knowledge of nature in the Middle Ages and its main traditions.	UK-1, OPK-1
27.	Revival of interest in ancient philosophy, development of humanism, technological advances.	What were the social and ideological prerequisites for the emergence of experimental method and its connection with mathematical description of nature.	UK-1, OPK-1
28.	Classical scientific rationality, non-classical scientific rationality, post-non-classical scientific rationality.	Match the types of scientific rationality with the stages of scientific development: classical, non-classical and post-non-classical scientific rationality.	UK-1, OPK-1
29.	Interdisciplinarity, empiricism and observation, critical thinking, ethical	What is the convergence of ideals and norms of natural science and social and humanitarian knowledge?	UK-1, OPK-1

	standards.		
30.	Social values: These values reflect societal needs such as sustainable development, health, ethics, and social justice. Intrascientific values are those related to scientific methodology, objectivity, rigor, critical thinking, and the search for truth.	Provide a correlation between social and intra-scientific values in modern science.	UK-1, OPK-1
31.	Scientism is a philosophical position that asserts that scientific knowledge is the only reliable source of true understanding of the world. The core methodological tenets of scientism include empiricism, objectivity, and reductionism.	What is scientism and its methodological principles?	UK-1, OPK-1
32.	Antiscentism criticizes scientism and argues that scientific knowledge is not the only path to understanding the world. The main arguments of antiscentism include the limitations of science, social context, ethics and values, and the diversity	Provide arguments for antiscentism .	UK-1, OPK-1

	of knowledge.		
33.	In scientific knowledge, a theory is a systematic explanation of observed phenomena based on empirical data and logical analysis. Key aspects of a theory include explanatory power, predictive power, testability, and knowledge coordination.	What does theory consist of as a form of scientific knowledge?	UK-1, OPK-1
34.	Mathematics creates models to describe complex phenomena in various sciences and enables data processing to identify patterns. Its principles are universal, facilitating the exchange of knowledge across disciplines and the prediction of future events.	Describe the capabilities of mathematics as a universal language of science.	UK-1, OPK-1
35.	Empiricism, rationalism, induction, social context.	Describe the main concepts of the origin of science.	UK-1, OPK-1
36.	A scientific research method is a specific method or procedure used to collect and analyze data, such as an experiment, observation, or survey. Methodology	Provide the concepts of method and methodology of scientific research.	UK-1, OPK-1

	is a system of principles and theories that guides the choice of research methods and justifies their use within the context of a particular scientific discipline.		
37.	Laws of logic: law of identity, law of contradiction, law of excluded middle. Features of scientific thinking: criticality, systematicity, objectivity, deductive and inductive approaches.	Provide the laws of logic and features of scientific thinking.	UK-1, OPK-1
38.	A concept is a generalized idea about a group of objects, phenomena, or properties, expressed through terms (e.g., "tree," "animal"). A judgment is a logical form that asserts or denies something about an object, consisting of a subject and a predicate (e.g., "A dog is an animal"). Inference is a logical process by which a new judgment is derived from one or more	Give a definition of the following terms: concept, judgment, inference as logical forms.	UK-1, OPK-1

	judgments (e.g., "All men are mortal, Socrates is a man, therefore Socrates is mortal").		
39.	Law of Identity: A statement is true if it is equal to itself ($A = A$). Law of Contradiction: It is impossible for the same statement to be both true and false (A cannot be both A and not A). Law of Excluded Middle: For any statement, one of two things is true: either it is true or it is false (A or not A).	Give the basic laws of logic.	UK-1, OPK-1
40.	A method is a method or procedure used to achieve a specific goal or solve a problem, based on a systematic approach. A theory is a system of valid ideas and principles explaining specific phenomena or facts that can be tested and confirmed empirically.	Define the following terms: method and theory.	UK-1, OPK-1
41.	By level of abstraction, by subject of research, by direction of research, by degree of formalization.	Provide criteria for the classification of scientific methods.	UK-1, OPK-1

42.	Modeling, analysis, synthesis, induction, deduction.	Provide methods of theoretical knowledge.	UK-1, OPK-1
43.	Laws of logic: the law of identity, the law of the excluded middle. Laws of thinking: the law of sufficient reason, the law of non-contradiction, the law of unity.	Give the laws of logic and the laws of thinking.	UK-1, OPK-1
44.	Concept, judgment, conclusion.	Give the basic forms of thinking.	UK-1, OPK-1
45.	Analysis is the breaking down of a whole into its constituent parts to study their properties. Synthesis is the combination of individual elements into a whole based on their interrelations. Induction is the derivation of general laws based on particular observations. Deduction is the derivation of specific consequences from general principles or rules. Abstraction is the process of highlighting certain properties of an object	Give definitions of general logical research procedures: analysis, synthesis, induction, deduction, abstraction, generalization, idealization, formalization, analogy.	UK-1, OPK-1

	while ignoring others. Generalization is the formation of broader concepts based on many specific cases. Idealization is the creation of a simplified model of an object, ignoring unimportant details. Formalization is the presentation of thoughts and ideas in a rigorous, mathematical or logical form. Analogy is the establishment of similarities between different objects or phenomena in order to draw new conclusions.		
46.	Science and existential questions of human life are linked by the fact that science seeks to explain the nature, existence, and place of humans in the universe by exploring physical and biological aspects. At the same time, existential questions concern the meaning of life, freedom	Provide a connection between science and existential questions of human life.	UK-1, OPK-1

	of choice, and moral dilemmas, requiring philosophical reflection. Scientific discoveries can influence understanding of these questions, while existential reflections can guide scientific research in search of deeper answers.		
47.	Science: empirical verification, falsifiability, systematicity, objectivity, repeatability. Pseudoscience: lack of empirical verification, impossibility of falsification, subjective claims, disregard for scientific consensus, frequent use of anecdotes.	Provide criteria for science and pseudoscience in modern culture.	UK-1, OPK-1
48.	An experiment is the fundamental empirical method of scientific research, involving targeted interventions in the conditions of an observed phenomenon to test a hypothesis. It allows for the control of variables, observation of changes, and	Give a definition of experiment as the main empirical method of scientific research.	UK-1, OPK-1

	establishment of cause-and-effect relationships, ensuring objective and reproducible results.		
49.	Hypothetico-deductive theory is an approach to scientific research based on the formulation of hypotheses, which are then tested through deductive logical reasoning and empirical experiments. Methods for substantiating the validity of hypotheses include falsification, experimental verification, and comparison with observations.	Provide a definition of hypothetico-deductive theory and methods for substantiating its truth.	UK-1, OPK-1
50.	Mathematical modeling is the use of mathematical equations to describe and analyze systems and processes. Computer modeling is the use of computer programs to simulate complex phenomena, allowing experiments to be conducted in a virtual environment. Statistical modeling is the analysis of data using	Describe the modeling methods used in modern scientific research.	UK-1, OPK-1

	statistical methods to identify patterns and predictions. Physical modeling is the creation of physical analogs of objects or processes to study their behavior under controlled conditions.		
51.	The systems approach is a research method that examines objects as holistic systems, focusing on the interactions between components and their interdependencies. Self-organization theory studies how complex structures and organized forms emerge from local interactions between system elements without external control.	Describe the systems approach and self-organization theory	UK-1, OPK-1
52.	Scientific culture is a set of values, norms, knowledge, and practices that shape the approach to scientific inquiry and research. It includes critical thinking, a commitment to objectivity, ethical standards, openness to	Give the concept of scientific culture.	UK-1, OPK-1

	new ideas, and collaboration among scientists. Scientific culture fosters the development of science and technology and shapes public understanding of scientific achievements.		
53.	Intuition and creativity are closely linked in scientific research, as intuition can serve as a source of ideas and hypotheses that are then explored more systematically. Creativity allows scientists to go beyond traditional approaches, find unconventional solutions, and generate new concepts. Together, they foster innovation and progress in science, helping to find unexpected connections and approaches to solving complex problems.	Provide a link between intuition and creativity in scientific research.	UK-1, OPK-1
54.	Scientific communication, including debate and	What is the role of scientific communication (controversy, discussion) in scientific research?	UK-1, OPK-1

	discussion, plays a key role in scientific research, as it facilitates the exchange of ideas, critical analysis, and hypothesis testing. Such interactions help identify the strengths and weaknesses of research, facilitate the improvement of methods and conclusions, and stimulate innovation and the development of new scientific directions. This is essential for ensuring transparency and improving the quality of scientific work.		
55.	Scientific ethics is a set of principles and standards regulating the conduct of scientists in research. It includes honesty, transparency, respect for research participants, environmental protection, and responsibility for the consequences of scientific activity. Scientific ethics aims to maintain public trust in	Describe the ethics of science.	UK-1, OPK-1

	science, prevent fraud and abuse, and ensure a fair and ethical approach to scientific practice.		
56.	The axiomatic-deductive method is based on establishing axioms from which theorems are derived using logical deductions. The hypothetico-deductive method, in turn, begins with the formulation of hypotheses, which are then tested experimentally. If a hypothesis is confirmed, it can be accepted as a provisional theory, but it does not have the same rigorous logical foundation as the axiomatic-deductive method.	What is the difference between the axiomatic-deductive and hypothetico-deductive methods of constructing theories?	UK-1, OPK-1
57.	Analytical methods involve the use of mathematical equations to accurately describe systems (e.g., differential equations). Numerical methods involve the approximate solution of equations using	Provide methods of mathematical modeling.	UK-1, OPK-1

	numerical algorithms (e.g., Euler's method, Runge-Kutta method). Statistical methods involve data analysis and model building based on statistical methods (e.g., regression analysis). Simulation modeling involves the creation of computer models to simulate system behavior (e.g., Monte Carlo simulation). Optimization methods – finding the best solutions under given conditions (for example, linear programming).		
58.	Classical mechanics describes the motion of bodies using Newton's laws. The theory of relativity explains gravity and motion in spacetime. Quantum mechanics models the behavior of particles at the microscopic level. Evolutionary theory explains the diversity of life through natural selection. The atomic	Provide models of theoretical explanation.	UK-1, OPK-1

	model describes the structure of the atom and the interactions between its parts.		
59.	Verification is the process of testing a theory against observed data. If a theory's predictions are confirmed by experiments, it is considered true or acceptable. Falsification is a principle proposed by Karl Popper, which states that a theory should be testable and potentially falsifiable. If observations contradict the theory, it should be rejected or revised.	What is verification and falsification as principles for justifying the truth of a theory?	UK-1, OPK-1

2. Description of the rating scale

Under the rating system, student performance in each course is assessed through ongoing assessments and midterm assessments. The student assessment system is based on a set of assessments designed to test the material covered, optimally spaced throughout the course.

3. Competency assessment criteria *

The grade "excellent" is awarded to a student if he/she selects information resources for searching for information in accordance with the assigned educational task, systematizes information obtained from various sources in accordance with the requirements for completing the educational task, formulates and argues conclusions and judgments, including using the philosophical conceptual apparatus, conducts expert work in mathematics, conducts expert work in the field of computer science, prepares methodological materials in the field of mathematics and computer science.

A grade of "good" is given to a student if he/she, with impairments, is able to select information resources for searching for information in accordance with the assigned educational task; with impairments, is able to systematize information obtained from various sources in accordance with the requirements of completing the educational task; with impairments, formulates and argues conclusions and judgments, including with the use of philosophical conceptual apparatus; conducts expert work in mathematics with errors; conducts expert work in the field of computer science with errors; and prepares methodological materials in the field of mathematics and computer science with errors.

The grade "satisfactory" is given to a student if he/she has difficulty selecting information resources for searching for information in accordance with the assigned learning task, has difficulty systematizing information obtained from various sources in accordance with the requirements of completing the learning task, has difficulty formulating and arguing conclusions and judgments, including with the use of philosophical conceptual apparatus, has difficulty conducting expert work in mathematics, has difficulty conducting expert work in the field of computer science, has difficulty preparing methodological materials in the field of mathematics and computer science.

The grade "unsatisfactory" is given to a student if he/she does not select information resources for searching for information in accordance with the assigned educational task, does not systematize information obtained from various sources in accordance with the requirements of the educational task, does not formulate and justify conclusions and judgments, including with the use of philosophical conceptual apparatus, does not conduct expert work in mathematics, does not conduct expert work in the field of computer science, does not prepare methodological materials in the field of mathematics and computer science.