

KAZAKH NATIONAL UNIVERSITY AL-FARABY

**Approved at the meeting
Scientific and methodological council
KazNU. Al-Farabi
Protocol No. 6
From "22" 06 2020**

**PROGRAM
INTRODUCTORY EXAMINATION FOR DOCTORS FOR EDUCATIONAL PRO-
GRAMS
«8D07303 - Cartography»**

ALMATY 2020

The program is compiled in accordance with the State General Education Standard in the educational programs "8D07303-CARTOGRAPHY". The program was compiled by Doctor of Geography, Professor Bekseitova RT, Doctor of Technical Sciences, Professor Kasymkanova Kh.M., c.g.s., Professor Shmarova I.N.

The program was considered at the meeting of the department
Protocol No. 39 of 16.06.2020

Head of the Department of Cartography and Geoinformatics _____ Kasymkanova H.M.

Approved at the meeting of the method bureau of the Faculty of Geography and Nature Management

Protocol No. 8 of 19.06.2020.

Chairman of the Method Bureau _____

Approved at the meeting of the Academic Council

Protocol No. 8 of June 19, 2020r.

Chairman of the Academic Council

Dean of the Faculty of Geography and Environmental

Sciences _____ Salnikov V.G.

Scientific secretary _____ Abdreeva Sh.

CONTENT

1. Goals and objectives of the entrance examination in the specialty

The purpose of the entrance examination is to identify the degree of theoretical preparation for undergraduates.

The task of the entrance examination is to identify the ability of students to do research work.

2. Requirements for the level of training of persons applying To doctoral studies

The applicant must have a state document of the corresponding level of higher education.

Prior education level

- A) higher basic education (master's) in the field (majors):
6M060900-Geography, 6M071100-Geodesy, 6M074100-Cartography
- B) higher special education in the field (specialties):
220200 - Automated systems for information processing and control;
511025 - Geoinformatics and others.

3. Prerequisites for the educational program

Cartographic study of geodynamic processes; Modern problems in the field of cartography; Application of geoinformation systems in cartography; Cartographic studies of the dynamics of geomorphological processes.

4. The list of examination topics

Discipline "Cartographic study of geodynamic processes"

Geodynamic processes: content and basic concepts. Endo-dynamic processes and their cartographic study.

Dynamic geomorphology - the main content, methods of study, basic concepts (relief, development, mechanism and process, signs). Geodynamics. Geodynamic processes: content and basic concepts. Endogenous and exogenous processes. Lithodynamics, morpholithogenesis, morpholithodynamics, morphotectonics.

Endogenous geodynamic processes, their mapping and cartographic features. The current state of classical geodynamics. The essence of the theory of tectonics of lithospheric plates. Thermal convection in the atmosphere. Seismotomography is the essence and results of research.

Modern ideas about the shell structure of the Earth, its features. Spreading. Subduction, its fossil zones, their "manifestations" on geological-tectonic maps. Subduction of type A and classical subduction of B. Slab type. Mantle magmatism in terms of tectonics of lithospheric plates and associated industrial mineralization of rare metals.

Ascending mantle jets and "hot spots" of the planet. Plumes, superplumes. Plum-tectonics, plate-tectonics. Rotational factor in the manifestation of the main features of the planetary relief.

Subduction, tectonics of lithospheric plates and planetary relief of the Earth as a result of interaction of the Earth-Moon system.

Tectonics of lithospheric plates and the most important geodynamic and geodetic tasks: the construction and refinement of the Earth's coordinate system, the study of tidal phenomena in the oceans and the earth's crust, the study of the gravitational field and the shape of the earth, the prediction of earthquakes.

Discipline "Modern problems in the field of cartography"

Features of the development of cartography in new conditions. Theoretical concepts of modern cartography.

Model-cognitive concept, its content and further development. The main areas of research: a systematic approach, cartographic modeling, the use of maps, the development of the theory of geographic mapping.

The communicative concept considers cartography as the science of the cartographic form of information transfer. The main areas of research: automation in cartography; Map-channel information; means of communication; Improvement of information transfer methods.

Language concept - the science of the language of the map, one of the branches of semiotics. The main areas of research: the development and improvement of the language of the map, its grammar, methods of automated design of sign systems and texts.

New integrated concept of cartography. Geoinformation concept and its main directions of theoretical research: development of the theory of geoinformation mapping of cartographic modeling, cartographic sign systems.

Cartographic modeling. Principles and methods of cartographic modeling. The importance of the principle of systematicity in cartographic modeling. Thematic maps as cartographic models. New directions in thematic mapping: ecological, geoecological, tourist, etc.

Telecommunication mapping. Drawing up and distribution of maps, other images and databases of digital cartographic information via remote communication networks.

Discipline " Application of geoinformation systems in cartography "

General information about GIS. Review of modern GIS, used in geodesy and cartography. GIS classification by territorial level, purpose, architecture. Technical components of GIS. Infrastructure of GIS. Domestic and foreign full-featured GIS.

Features of full-featured GIS. Features of GIS application for solving applied problems of geodesy and cartography.

Software development tools (software). Stages of GIS software development. Software components or libraries. Famous software development environments in various programming languages (Microsoft Visual C, Borland / Inprise Delphi). Systems that include data entry, storage, complex queries, spatial analysis, data output, proprietary programming languages.

Spatial Data Models. The main technological stages of data processing in GIS. Digital modeling and digital models (digital cartography, digital map, DTM, DTM, CMO). Spatial Data Models. Information basis of GIS - digital models of reality (digital, analog). Digital data models (raster, vector).

Project GIS panorama. Technology, software structure. GIS technology. The main tasks solved in the GIS. Software structure. Types of data processed. Technology of creating and updating TSC, DTM, DEM, three-dimensional scenes using GIS. Classification and coding system, digital description rules, sign system, presentation formats. Quality control tools.

Remote sensing of the Earth and GIS.DDZ. Features of the software for the processing of DSD. Digital photogrammetric systems (domestic, foreign). Concept and principles of laser location.

Discipline " Cartographic studies of the dynamics of geomorphological processes "

Scientific-methodical bases of registration of cards. The laws of viewer-ship and their application in the design of the design of general geographic and thematic content on maps.

Font, stroke and background design of maps. Black and white relief design. Classification of hypsometric scales and method of their construction. Picturesque design of maps and atlases.

Cartographic semiotics. Design of maps and atlases. Computer technologies in the design of maps. Hardware and software tools for computer graphics, imposition programs, multimedia graphics. Computer design.

The concept of originals, their types. The main way would be to compile the originals of maps, their classification. General scheme of the composition of originals of maps from cartographic sources. Method of drawing up the originals of maps. Rational forms of organization of cartographic works.

Ways to update large-scale maps. Use of remote sensing materials to update them. Technical means used to create originals of maps Perspective technical means and technologies introduced in cartographic production.

The place of preparation of maps for publication in the general complex of work on the creation of maps. The role and main duties of the technical editor at the stages of editorial, drafting and design work. Publishing originals. Methods of their manufacture, advantages and disadvantages. The choice of how to prepare maps for publication.

Colorful original, dashed sample, cartographic makes, their purpose. Schemes of technological processes for preparing maps for publication. Photographic equipment and photographic materials. Reproduction of dashed, halftone and multicolor originals. Theoretical basis of copying processes.

Basic materials and equipment of copying processes. Technologies for making copies on paper and plastics. Theoretical bases of flat printing. Techniques for making printed forms. Technical editing of maps and atlases. Schemes of technological processes for issuing maps on traditional technologies. Features of the publication of atlases. Small-circulation methods of issuing maps. Paper and paints for the edition of maps: production methods, characteristics, properties.

Computer technologies in preparing maps for publication. Means and methods of layout. Electronic color separation: theoretical bases, technologies, software and hardware complex. Color-separated transparencies, quality control of print runs.

Discipline "Problems of thematic mapping"

The essence and purpose of electronic charts, their classification. Requirements for electronic cards. Principles and methods of designing and manufacturing electronic cards. The technology of creating electronic maps.

Cartographic hardware systems. Automated input systems. Systems of pattern recognition. Large-format displays.

Ways of storing information. Technologies of operative printing with the use of plotters. Creation of multimedia electronic maps and atlases. The essence of geoinformation mapping. Purpose, functions and ways of implementation. Information, technical and software support. Purpose and functions of geoinformation systems (GIS). Structure and models of spatial data in GIS.

Components of the GIS. Hardware and software GIS. Vidy GIS on thematic content and scale-bu. Topological and cartographic representation of data. Data formats. Types of objects. Database management systems (DBMS), their formats, types and basic functions. Spatial queries and cartometric calculations. Geometric and arithmetic utilities. Utilities for working with databases.

Analytical functions of GIS. Designing of thematic GIS. Modern technologies of access to cartographic data. Large-scale (topographic) digital mapping. Small-scale (cameral) digital mapping. Distinctive features. Automatic (software) processing of information. Automated (interactive) information processing. Formation of a small-scale database of cartographic data (MBCD).

Scientific and methodological foundations for the formation and transformation of BDAC. The concept, definition and classification of cartographic databases. Purpose, structure and general scheme of the automated cartographic system (AKS). Formation of the Information and Information Fund (CIF) of the information system.

General concepts of the banks of cartographic data, definition, classification. Use of cartographic data banks for the mapping and development of GIS projects.

5. Scale of complex examination assessment

Evaluation by letter system	Digital Equivalent of Balls	% Content	Assessment by traditional system
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	
B-	2,67	75-79	
C+	2,33	70-74	Satisfactorily
C	2,0	65-69	
C-	1,67	60-64	
D+	1,33	55-59	
D-	1,0	50-54	
F	0	0-49	Unsatisfactory

"A" - Excellent: Must demonstrate a complete understanding of the issues, the main stages in the development of cartographic science and the replacement of paradigms in the evolution of science; Demonstrate the scientific concepts of the world and Kazakh science in the field of cartography, thematic geoinformation mapping; Know the current trends, trends and laws of the development of Russian science in the context of globalization of economic, social or political problems and the internationalization of the world community; Critically analyze, evaluate and compare various scientific theories and ideas; To process information on cartography, thematic geoinformation mapping from various sources; To demonstrate the presence of a significant amount of scientific knowledge, acquired systematically and reflecting the current state of the scientific branch or field of professional activity; Be able to develop and implement projects to create new knowledge or practical applications in the relevant areas of the relevant scientific field and the ability to adapt projects in the light of emerging unforeseen problem situations.

Full answer on the merits of the question, with the necessary formulas, graphs, drawings and their explanations. Full system knowledge and the development of educational material, a description of both the basics and details of the topic under consideration, the absence of errors on the merits of the matter.

"B" - Good: Must demonstrate a significant understanding of the issues, trends, ideas and processes, - be able to carry out further theoretical and / or applied research and development at a high level, making a significant contribution to the creation of new ideas, approaches and methods ; To have the skills of speaking and public speaking on the defense of dissertational work, international scientific forums, conferences and seminars in the field of cartography; Have personal qualities and system skills necessary for employment in areas requiring personal responsibility and significant independent initiative in complex and unpredictable professional situations.

Partial (or superficial) answer on the merits of the matter, without significant errors; Answer on the merits of the matter, but with significant errors or lack the necessary formulas, graphs, figures, and their explanations. Conscious presentation of most of the program material, the presence of non-essential errors.

"C" - Satisfactory: Answers testify to the existence of a significant misunderstanding of problems, various general scientific and specific scientific approaches and methods of study adopted in the cartographic field of knowledge, as well as political and socio-economic phenomena. He has only skills in using information technologies to simplify research and practical work, inability to analyze problems caused by anthropogenic processes, to seek solutions, integrated management and observation of changes, to make conclusions.

The answer is not a complete (30%) presentation of the material with numerous significant errors (there is an answer, but not on the merits of the question, ie, on the other issue of the discipline program).

"D" -Bad: Refusal of answers or answers indicate a complete lack of understanding of the problem. Understanding and using ideas and thoughts related to the main problems of ecology and nature management of global, regional, local scales.

Score of responses

Issue number of the examination ticket	Score of the answer (points)
Вопрос 1	100
Вопрос 2	100
Вопрос 3	100
Итоговая оценка	100+100+100 / 3

Head of Department

Cartography and geoinformatics

Doctor of Technical Sciences, Professor _____ Kasymkanova Kh.M.