

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
«8D07302 - Geoinformatics »**

ALMATY 2020

The program is compiled in accordance with the State General Education Standard in the educational programs "8D07302-_GEOINFORMATICS". The program was compiled by PhD, Acting Associate Professor Kakimzhanov Y.Kh., Doctor of Technical Sciences, Professor Kasymkanova Kh.M., candidate of physical and mathematical Sciences, Associate Professor Mansurova M.E.

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,
6M060200 – Computer science, 7M07302 - Geoinformatics
- 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

Design and mapping in the GIS program; development of a GIS portal; Development of Web GIS applications; geoinformation mapping of Kazakhstan.

4. The list of examination topics

Discipline "Geographic information system for research and analysis "

Features of GIS development in new conditions. Theoretical concepts of modern Geoinformatics. The approach of the study. Geoinformatics and mathematical modeling.

Fundamentals of Geoinformatics and GIS technologies. Formation and stages of development of Geoinformatics. Basic data structures in GIS. Representation of spatial objects in GIS. Cartographic basics of GIS technologies. Spatial analysis based on a vector representation of data.

GIS in geographical research. Composition of geographical information systems. Design of geographical information systems. The development tools of GIS.

GIS and the Internet. The technology of creating maps using geographic information systems. Areas of application of geoinformation technologies.

Discipline " GIS data visualization and analysis "

Geographic information system: content and basic concepts. Geoinformatics: science, technology, industry and their periodization of development.

The functionality of the GIS. Data entry, preprocessing, and storage. Data source. Spatial data models. Analog-to-digital data conversion. Databases and their management.

Geoanalysis and modeling. General analytical operations and methods of space-time modeling. Classifications. Digital terrain modeling. Mathematical and cartographic modeling.

Data visualization. Map visualization. Images in a non-Euclidean metric. Virtual reality images. Cartographic animations.

GIS as the basis for integrating spatial data and technologies. GIS and remote sensing. GIS and global positioning systems. GIS and the Internet. Concept of multimedia.

Intellectualization and support decision-making in Geoinformatics. Artificial intelligence technologies and expert systems. Neural networks and GIS. System of support of decision-making.

Discipline " Interpretation and analysis of remote sensing images "

General information about remote sensing. History of development of remote sensing methods. Stages of remote sensing and data analysis. Resolution of remote sensing systems. General classification of sensors and platforms. Receiving, transmitting, and processing data. Spatial orientation of the satellite.

Methods of interpretation. Processing digital images. Statistical indicators of the source data. Correction and restoration of images. Improving the visual perception of images. Conversion of images. Classification and analysis of images.

Application of remote sensing data. Land use and mapping of land resources. Mapping of ground water. A study of urban growth. Flood control. Hydromorphological research. Mapping of vacant land. The fight against natural disasters.

Spatial data analysis. Combining data, mapping overlay. Spatial interpolation. Methods for terrain visualization.

New methods for processing remote sensing data. Assessment of classification accuracy. Digital photogrammetric systems (domestic, foreign). Concept and principles of laser location.

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.