

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY**

APPROVED

Chairman of the enrollment commission

«__» _____ 2021 year



PROGRAM

**PROFESSIONAL ENTRANCE EXAMINATION FOR FOREIGNERS
ENTERING AT THE THIRD (PhD) LEVEL
IN THE FIELD OF STUDY 10 «NATURAL SCIENCES»
SPECIALTY 101 «ECOLOGY»**

SUMY – 2021

Professional entrance examination for foreigners entering at the third (PhD) level in the field of study 10 «Natural Sciences» specialty 101 «Ecology» – 2021.
– 14 p.

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INTRODUCTION

Ecology is a science that studies the laws of relations between organisms and the environment, as well as the organization and activity of superorganism systems (populations, species, biocenoses, biosphere. Modern ecology – is an environmental science based on a body of knowledge about living organisms at different levels biological organization, their evolution, spatial distribution and dynamics of biological systems in time. The structure of modern ecology distinguishes the following main areas: general, social and applied ecology. These features of ecology as a science and were taken into account in the formation of the Entrance Test Program.

The idea of the Program – it is designed to ensure successful preparation for the entrance exam for graduate school in the specialty 101 «Ecology». The development of the program takes into account the materials of modern textbooks, manuals, monographs and methodological developments.

The content of the Ecology Program reflects the current state of development of this science and includes all its most important sections, knowledge of which is necessary for the implementation of applied and scientific activities of highly qualified specialists.

A prerequisite for achieving efficiency in mastering the educational and scientific program in «Ecology» is a systematic study of topics, issues and literature presented in it. Working on the program will help graduate students identify priorities for future research and demonstrate a high level of theoretical and practical training, a deep understanding of the theoretical foundations of the field, and the ability to apply their knowledge to solve research and applied problems.

1. CONTENT OF DISCIPLINES OF THE PROFESSIONAL ENTRANCE EXAMINATION

Ecology in the modern world. Ecology as a system science. Definition of ecology. The place of ecology in the system of biological sciences, natural, social and technical sciences. Ecology in the modern world. Development of ecological knowledge and their role in the formation of civilization. Historical aspects of the formation of ecology as a science. Ukrainian Ecological School. Objects of study in ecology. Methods of ecological research. General laws of ecology. Scientific and technological progress and environmental issues.

Ecology at the level of the organism. Representation of the environmental factor. A variety of environmental factors. Limiting factors. Resources and living conditions. Patterns of action of environmental factors on organisms. Complex action of ecological factors on organisms and their interaction. Limits of life, activity and development.

Classifications of environmental factors. Influence of light, photoperiod, biological times. Influence of temperature. Poikilothermic and homoiothermic organisms. Influence of humidity. Water balance in the body. Influence of salinity and osmoregulation. Influence of other environmental factors. Simultaneous action of many environmental factors. Adaptations of organisms. Climate. The main climatic zones of the Earth. Relationship between climate and vegetation. Overview of the main meso- and microclimates. Ecological living conditions in soil and water. Features of the action of edaphic factors. Nutritional factors. Ecological niche.

Climate and vegetation of the region. Conditionality of vegetation by climatic factors. The importance and need to understand the relationship between climate and vegetation. Regional and local factors influencing the formation of climatic conditions. Changes in the type and nature of vegetation depending on the action of major climatic factors. Formation of animal complexes depending on the type and nature of vegetation. Natural and climatic conditionality of economic activity. Types of agriculture and their location depending on natural and climatic conditions. Dependence of forestry on natural and climatic conditions. Natural and climatic conditionality of some environmental problems. The importance and necessity of preserving intact climatically determined vegetation types in the country.

Populations, ecosystems. Ecology at the population level. Representation of populations. Insulation. Types of insulation. Natural selection in populations. Waves of life. Variety of life forms and their leading characteristics. Population

indicators: number, density, distribution of individuals. Types of distribution of individuals in populations. Mass reproduction of organisms and their causes. Living organisms and biotic interactions in ecosystems. Strategies of life in living organisms.

The concept of populations. Features of plant and animal populations. Population size and structure: ontogenetic, age, size, vitality, spatial. Population strategies and evolution. Methods for determining the structure of populations. Population dynamics.

Organization of life at the level of ecosystems. Systems in nature. Ecosystem concept. Structure and functions of ecosystems. Ecosystem properties. The concept of homeostasis in ecosystems. Ecosystem models.

Types of interactions between organisms in biocenoses and ecosystems. Diversity and stability of biocenoses. Homeostasis. The concept of «biogeocenosis» and «ecological system». Modeling. Problems of ecosystem modeling. Trophic levels. Trophic structure. Trophic chains and trophic network. Concentration of substances in trophic chains. Ecological pyramids. Productivity of groups and ecosystems. Development and evolution of ecosystems. Successions. Climax ecosystems. Artificial ecosystems.

Diversity of ecosystems. Ecosystems of the world and Ukraine: their leading features and preservation. Principles of limiting bioproducts. Production process management. Biodiversity as the basis for the sustainable existence of ecosystems. General principles of stability and sustainability of biosystems and ecosystems. Adaptation. Sustainability of organisms, populations and ecosystems.

Agroecosystems and their leading features. Agricultural plants and animals as a product of selection and genetic design. Environmental aspects. Energy analysis of agroecosystems. Coexistence in agroecosystems. Weeds, diseases and pests. Factors stabilizing agroecosystems. Crop rotation. Melioration.

Global ecology. The concept of the biosphere. Biosphere as a global ecological system, its structure. V.I Vernadsky's doctrine of the biosphere. Representation of the noosphere and technobiosphere. The flow of energy on the globe. Biogeochemical cycles. Man's place in the biosphere. Global ecology: present and future. Human civilization as a factor in the existence of the biosphere. Sources of the ecological crisis of today and its impact on the biosphere. Forms and mechanisms of biosphere degradation, the role of different industries in this.

Applied ecology. Current environmental problems facing man: global population growth, soil erosion and pollution, large city growth, deforestation, irrational use of water and energy resources, possible climate change, negative impact on biodiversity and more. Living organisms under conditions of anthropogenic stress. Transformation and degradation of the Earth's biota.

Influence of anthropogenic factors on the condition of vegetation. Territorial aspects of anthropogenic pollution. The current state of Ukraine's environment.

Engineering ecology. Environmental and environmental technologies. Military aspects of biosphere degradation. Medical ecology: essence and current problems. Environmental aspects of providing the population with food. Intensification of agriculture: environmental aspect. Wastes from agricultural production. Environmental pollution. Strategy of modern agricultural use, its ecological aspects. Types of industrial production. Industrial facilities as ecosystems. Geography of industrial production. Transport systems. Conflict situations of industrial nature management. The problem of waste accumulation: the essence, current issues, solutions, domestic and international experience. Waste disposal and disposal. Treatment plant. Cities of the future.

Ecological conversion is an urgent problem of civilized humanity. Ecological conversion in industry. Ecological conversion in agriculture. Greening of energy: the essence of the issue, problems and prospects. Environmental impact assessment: the essence of the issue, problems and prospects directly

Demographic factors in ecology. Social ecology. Urban ecosystems. Urban infrastructure. City buildings. Building materials. Water supply. Energy systems of cities. Ecology of urban transport. Ecological environment in cities. Meso- and microclimate. Plants and animals in the city. Man in an urban environment.

Biodiversity and environment protection. Environmental concept. Ecological network of Ukraine: approaches to formation and its current state. Nature Reserve Fund of Ukraine. Gene pool protection. Red Book of Ukraine. Price fund protection. Green Paper of Ukraine. Ecosystem protection. Global environmental problems. Monitoring. Methods and forms of monitoring the state of ecosystems. Socio-organizational and legal bases of nature protection. Economic criteria in ecology. Environmental policy. Nature protection at the state and interstate levels. International environmental agreements and conventions. Modeling and forecasting in ecology.

2. LIST OF QUESTIONS ON THE PROFESSIONAL ENTRANCE TEST

List of questions in English.

1. Ecology as a science, its content, tasks, objects of research. Connection of ecology with other disciplines, modern development.
2. Development of ecological knowledge and their role in the formation of modern civilization.
3. The idea of systematics in ecology.
4. Social aspects of ecology.
5. Objects of study in ecology.
6. Methods of ecological research.
7. A short essay on the history of ecology. Ukrainian Ecological School.
8. The concept of the biosphere. The structure of the biosphere.
9. The flow of energy on the globe.
10. Biogeochemical cycles.
11. The place of man in the biosphere. The concept of environment
12. General laws of ecology
13. Human civilization as a factor in the existence of the biosphere
14. Ecosystems as the main structural units of the biosphere
15. Abiotic components of ecosystems. Resources and living conditions
16. Influence of abiotic factors on the state of biodiversity and ecosystems
17. Living organisms and biotic interactions in ecosystems.
18. Trophic chains and trophic pyramids
19. Concentration of substances in trophic chains
20. Development and evolution of ecosystems
21. Successions
22. Artificial ecosystems - ecospheres
23. Diversity of ecosystems. The main ecosystems of the world and Ukraine
24. The concept of populations. Features of plant and animal populations
25. Ecological niches
26. Strategies of plant and animal life
27. Population size. Spatial structure of the population
28. Intrapopulation structure, its diversity and methods of study
29. Population dynamics
30. Liebig's law of minimum and Shelford's law of tolerance.
31. Environmental factors, their classification.
32. Abiotic factors, features of their action on living organisms: temperature, light, edaphic conditions, pressure, salinity.
33. Light and its significance for organisms. Classification of organisms according to their relation to various abiotic factors.
34. Daily and seasonal rhythms of activity of organisms.
35. Photoperiodic reactions and their types.

36. Biocenosis and its structure.
37. Competitive relationships. features of intraspecific and interspecific competition.
38. Predation and predator-prey relationships.
39. Phenomena of parasitism.
40. Mutual influence of organisms in competitive relationships, as well as in relations such as "predator-victim", "parasite-host".
41. The phenomenon of mutualism and its significance for organisms.
42. Food as a biotic factor. Types of nutrition of organisms.
43. Autotrophic and heterotrophic nutrition. features of nutrition of microorganisms, plants, animals and humans. production process and its environmental aspects
44. Producers, consumers and reducers
45. Genetic factors of productivity. Environmental productivity control. Cenotic performance control.
46. Diversity of biomes and ecosystems. Bioproducts in different biomes
47. Diversity of ecosystems of Ukraine, their leading features and preservation
48. Forest ecosystem. Layering in ecosystems - its importance and reasons for formation.
49. Organization of the ecosystem on the example of meadows.
50. Organization of the ecosystem on the example of the steppe.
51. Features of the ecosystem on the example of the desert.
52. Principles of limiting bioproducts. Production process management
53. Biodiversity as the basis for the sustainable existence of ecosystems
54. General principles of stability and sustainability of biosystems and ecosystems
55. Adaptation. Sustainability of organisms, populations and ecosystems
56. Scientific and technological progress and environmental problems
57. Sources of the current environmental crisis and its impact on the biosphere
58. Forms and mechanisms of biosphere degradation, the role of industrial and agricultural production in these processes
59. Military aspects of biosphere degradation
60. Human impact on global biosphere processes
61. Living organisms under conditions of anthropogenic stress. Transformation and degradation of the Earth's biota
62. The influence of anthropogenic factors on the state of vegetation
63. Territorial aspects of anthropogenic pollution. The current state of Ukraine's environment
64. Environmental aspects of providing the population with food
65. Agroecosystems and their leading features
66. Agricultural plants and animals as a product of selection and genetic design. Environmental aspects
67. Energy analysis of agroecosystems

68. Coexistence in agroecosystems. Weeds, diseases and pests
69. Factors stabilizing agroecosystems. Crop rotation. Melioration
70. Intensification of agriculture: environmental aspect
71. Wastes of agricultural production. Environmental pollution
72. Strategy of modern agricultural use, its environmental aspects.
73. Types of industrial production. Industrial facilities as ecosystems
74. Geography of industrial production. Transport systems
75. Scientific and technological progress and ecology
76. The impact of industrial production on the biosphere
77. Conflict situations of industrial nature management
78. Urban ecosystems. Urban infrastructure. City buildings. Building materials. Water supply. Energy systems of cities. Ecology of urban transport.
79. Ecological environment in cities. Meso- and microclimate
80. Plants and animals in the city
81. Man in an urban environment. Medical ecology: essence and current problems
82. The problem of waste accumulation: the essence, current issues, solutions, domestic and international experience. Waste disposal and disposal. Treatment plant. Cities of the future
83. Ecological conversion is an urgent problem of civilized humanity
84. Ecological conversion in industry
85. Ecological conversion in agriculture
86. Greening of energy: the essence of the issue, problems and prospects
87. Environmental impact assessment: the essence of the issue, problems and prospects
88. Demographic factors in ecology. Social ecology
89. Environmental concepts
90. Ecological network of Ukraine: approaches to formation and its current state.
91. Nature Reserve Fund of Ukraine
92. Protection of the gene pool. Red Book of Ukraine
93. Protection of the price fund. Green Book of Ukraine
94. Protection of ecosystems
95. Global environmental problems
96. Monitoring. Methods and forms of monitoring the state of ecosystems
97. Socio-organizational and legal bases of nature protection
98. Economic criteria in ecology
99. Environmental policy. Nature protection at the state and interstate levels. International environmental agreements and conventions
100. Modeling and forecasting in ecology

3. CRITERIA FOR EVALUATION OF KNOWLEDGE

Grades (marks)			Criteria for assessing knowledge
1	2	3	4
A «Excellent»	Excellent	90-100%	The graduate student showed comprehensive, systematic and deep knowledge of the educational material provided by the program; mastered the literature recommended by the program; showed creative abilities in understanding, logical, concise and clear interpretation of educational material; mastered the relationship of basic concepts of the discipline, their significance for further professional activity.
B «Very Good»	Very Good	82-89%	The graduate student showed systematic and deep knowledge of the educational material of the discipline above the average level; demonstrated the ability to freely perform the tasks provided by the program; mastered the literature recommended by the program; mastered the relationship of basic concepts of the discipline, their importance for further professional activity.
C «Good»	Good	75-81%	The graduate student showed generally good knowledge of the academic material of the discipline in performing the tasks provided by the program, but made a number of notable mistakes; mastered the basic literature recommended by the program; showed the systematic nature of knowledge of the discipline; capable of independent use and replenishment of acquired knowledge in the process of further educational work and professional activities.
D «Satisfactory»	Satisfactory	68-74%	The graduate student showed knowledge of the educational material of the discipline to the extent necessary for further study and future professional activity; coped with the tasks provided by the program; get acquainted with the main literature recommended by the program; made a significant number of errors or shortcomings in the answers to questions during interviews, testing and tasks, etc., the principles of which can be eliminated independently.
E «Sufficient»	Sufficient»	60-67%	The graduate student showed knowledge of the basic educational material of the discipline in the minimum amount necessary for further study and future professional

			activity; mainly performed the tasks provided by the program; get acquainted with the literature recommended by the program; made mistakes in answering questions during interviews, testing and tasks, etc., which can be eliminated only under the guidance and with the help of a teacher.
FX «Unsatisfactory»	Unsatisfactory	45-59%	The entrant to graduate school has significant gaps in knowledge of the basic educational material of the discipline; made fundamental mistakes in performing the exercises provided by the program.
F «Fail»	Fail	0-44%	The graduate student did not have knowledge of much of the study material; made fundamental mistakes in performing most of the tasks; unable to master the program material on their own.

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