

# МІЖНАРОДНА АКАДЕМІЯ ЕКОЛОГІЇ ТА МЕДИЦИНИ

📍 Харківське шосе, 121, Київ, 02091  
✉ rector@maem.edu.ua  
☎ +38 044 5639854 +38 098 0007716  
🌐 maem.edu.ua



ЄДРПОУ 37857335

# INTERNATIONAL ACADEMY OF ECOLOGY AND MEDICINE

📍 Kharkivs'ke Hwy, 121, Kyiv, 02091  
✉ rector@maem.edu.ua  
☎ +38 044 5639854 +38 098 0007716  
🌐 maem.edu.ua

“APPROVED”  
Acting Rector  
*Ilvan SAVYETSKYI*  
“ 23 May 2024”  
Інтернаціональна Академія Екології та Медицини  
Ідентифікаційний код 37857335

PROGRAM  
Biology  
Admission exam for foreign citizens

Kyiv – 2024

## EXAMINATION AIMS AND TASKS

The main aim of admission biology exam is an objective and fair-minded estimation of the level of academic achievements of foreign students that graduated from general educational establishment and interested in enrollment to the International Academy of Ecology and Medicine.

The purpose of the exam is to:

- check the ratio of applicants' knowledge and skills to the program requirement;
- determine the applicants' academic achievement level;
- evaluate the preparation of applicants for further studying in higher educational establishment.

The program of admission biology exam for foreign citizens and persons without citizenship, that are interested in getting higher degree in IAEM on the basis of general secondary education, is compiled according to aims, demands and content of valid "Biology" curriculum for general educational establishments and "The program of external independent testing for applicants, that want to get a degree on a basis of general secondary education" (By an order of the Ministry of Education and Science of Ukraine No 1426 from 20.12.2018).

Admission biology exam is aimed at revealing the level of knowledge understanding and skill application from "Biology" discipline. On their basis the applicant is able to:

- characterize basic biological terms, patterns, laws, theories, concepts and processes;
- handle the concepts, confirm it with examples of human life and activities, health-care, biological science achievements;
- compare aspects of living on different levels of organization (molecular, cellular, population and species, ecosystemic, biospheric) and identify relation between them;
- identify cause-and-effect, functional, structural links and patterns in wildlife, classify objects;
- identify harmful effect of pernicious habits on human body;
- analyze real-life situations by applying biological knowledge;
- calculate with the help of mathematical tool;
- apply gained knowledge when analyzing different forms of information (graphic, schedule, text);
- justify conclusions.

The program is discussed and approved on the meeting of International Academy of Ecology and Medicine Admission committee (the protocol № \_\_\_\_\_ from \_\_\_\_\_).

## PROGRAM

Introduction	The main signs of life. Levels of life organization. Methods of biological research.
Molecular level of life organization	The elementary composition of organisms. Inorganic and organic compounds. Structure, properties and functions of organic compounds. Carbohydrates. Lipids. Amino acids. Enzymes. Nucleotides. Biologically active substances.
Cellular level of life organization	Cytology. Methods of cytological research. Cell structure of eukaryotes and prokaryotes. Biological membranes. Cell organelles. Cytoplasm. Pinocytosis. Phagocytosis. Supramembrane and submembrane complexes. Mitochondria. Core. Mitosis. Meiosis. Features of the organization of prokaryotic cells. General ideas about metabolism and energy conversion in the body. ATP, its structure and functions in the body. Stages of energy conversion in the body. Protein biosynthesis and its stages. Genetic code and its properties. The concept of matrix synthesis reactions. Biosynthesis of carbohydrates, lipids and nucleic acids. General ideas about photosynthesis. The main events of light and tempo phases of photosynthesis in chloroplasts. The influence of environmental conditions on the intensity of this process. Features of photosynthesis in prokaryotes. The value of photosynthesis for the existence of the biosphere. Chemosynthesis and its significance. Excretion of metabolic products. The role of enzymes in ensuring metabolic processes.
Non-cellular life forms	Viruses, their chemical composition, structure and recovery. The mechanism of penetration of viruses into the body and host cells. Prevention of human viral diseases. Prions. Viroids.
Organic level of organization of life	Bacteria. General characteristics of bacteria. Variety. Significance in nature and in human life.
	Plants. Structure and vital functions of plants. The main processes of plant life. Cells, tissues, plant organs, their functions and relationships. Habitats of plants. Relationships of plants with other components of the ecosystem. Reproduction and development of plants. Asexual reproduction, its species. Vegetative reproduction. Regeneration in plants. Sexual reproduction. The structure and variety of flowers. Inflorescence. Pollination, fertilization. Seeds, fruit, their structure. Influence of environmental conditions on seed germination. Plant growth and development. seasonal phenomena in plant life.
	Algae. General characteristics of algae. Habitats. Adaptive features of the structure and activity of algae. Diversity of algae, their importance in nature and in human life.
	Higher spore plants. General characteristics of higher spore plants. Moss-like, flounder-like, horsetail-like, fern-like. Habitats. Adaptive features of the structure and processes of life. The importance of higher spore plants in nature and in human life.
	Angiosperms. General characteristics of gymnosperms. Habitat. Adaptive features of structure and vital activity of gymnosperms. Variety of gymnosperms. Significance in nature and in human life.
	Angiosperms. General characteristics. Classification of angiosperms. Characteristics of classes and individual families. The importance of angiosperms in nature and in human life. Agricultural and medicinal plants.
	Mushrooms. General characteristics of fungi. Variety of mushrooms. Distribution, habitats. The importance of fungi in nature and in human life. Lichens. General characteristics of lichens as symbiotic organisms. The importance of lichens in nature and in human life.
	Animals. The animal world is an integral part of nature. Animal diversity and their classification. The role of animals in human life. Structure and vital functions of animals. The main processes of animal life. Cell structure of animals and features of animal cells. Tissues, organs and organ systems of animals, their functions. Animal

	<p>habitats. Animal behavior. A variety of animal lifestyles. Connections of animals with other components of ecosystems. The simplest. General characteristics and variety of protozoa. Parasitic protozoa. The role of protozoa in ecosystems and their significance for humans.</p>
	<p>Multicellular. General characteristics and diversity of multicellular animals. Sponges. General characteristics, role in nature and significance for humans. Intestinal. General characteristics and diversity of intestinal. The role of intestinal cavities in ecosystems and significance for humans. Protection of sponges and intestinal. Worms. Flatworms. General characteristics, diversity. Roundworms. General characteristics, diversity. Ringworms. General characteristics, diversity. Value for man. Arthropoda. General characteristics. Shellfish. General characteristics. diversity and role in ecosystems. Arachnids. General characteristics. diversity and role in ecosystems. Insects. General characteristics. diversity and role in ecosystems. Features of development. Behavior of insects. Clams. General characteristics.</p>
	<p>Chordates. Cartilaginous fish. General characteristics, features of life processes, behavior, diversity of cartilaginous fish. Role in ecosystems and economic importance of cartilaginous fish. Bone fish. General characteristics of the class, features of life processes. Behavior and seasonal phenomena in the life of fish. The importance of fish in human life. Fisheries.</p>
	<p>Amphibia. General characteristics. Features of life processes and behavior. Seasonal phenomena in the life of amphibians. A variety of amphibians. The role of amphibians in ecosystems. Protection of amphibians.</p>
	<p>Reptiles. General characteristics. Features of life processes and behavior. Seasonal phenomena in the life of reptiles. A variety of reptiles. The role of reptiles in ecosystems, their significance for humans.</p>
	<p>Birds. General characteristics. Features of bird life. Features of adaptation to flight and different living environments. A variety of birds. Reproduction and development of birds. Seasonal phenomena in the life of birds. Behavior of birds: nesting, mating behavior, care for offspring. Birds fly. The role of birds in ecosystems. Their significance for, man. Protection of birds.</p>
	<p>Mammals. General characteristics. Features of mammalian life. Diversity of mammals. Seasonal phenomena in the life of mammals, their behavior. The role of mammals in ecosystems, their importance to humans. Mammal protection.</p>
	<p>Human. The human body as a biological system. The concept of biological systems. Features of cell structure. General ideas about metabolism and energy conversion in the body. Characteristics of tissues. Organs. Physiological systems of human organs. Regulatory systems of the human body. Support and movement. Structure and functions of the musculoskeletal system. Bone and cartilage tissues. Bone development. The combination of bones. The structure of the human skeleton. Skeletal muscle structure and function. Muscle types. Mechanism of muscle contraction. Muscle strength. Muscle fatigue. Blood and lymph. The internal liquid environment of the human body. Composition and functions of blood. Protective functions of the blood. Immunity. Specific and nonspecific immunity. Blood circulation and lymph circulation. Circulatory organs: heart and blood vessels. The structure and function of the heart. Vascular system. The movement of blood through the vessels. Large and small circulatory system. Regulation of blood supply to organs. Lymph circulation and its significance. Breath. The value of respiration. Structure and functions of the respiratory system. Voice machine. Respiratory movements. Gas exchange in the lungs and tissues. Neurohumoral regulation of respiration. Nutrition and digestion. Energy needs of the body. Types of nutrients. Nutrition and health. Structure and functions of digestive organs, digestive glands. Digestion in the small intestine. Regulation of</p>

digestion. Thermoregulation. Maintaining body temperature. Heat transfer. The structure and function of the skin. The role of the skin in thermoregulation. Excreta. Structure and functions of the urinary system. Regulation of the amount of water in the body. The role of the skin in the allocation of vital products. Endocrine regulation of human body functions. Principles of endocrine system. Endocrine glands. Hormones. Hypothalamic-pituitary system. Reproduction and human development. Stages of human ontogenesis. Formation of sexual characteristics. Genetic sex determination. The structure of the genitals. Germ cell development. Fertilization. Embryonic development. Functions of the placenta. Postembryonic human development. Nervous regulation of human body functions. The structure of the nervous system. Central human peripheral nervous system. Regulation of motor activity. Spinal cord. Brain. Brain stem. Subcortical nuclei. Arbitrary movements and cerebral cortex. Regulation of internal organs. Autonomic (autonomic) nervous system. Sympathetic and parasympathetic nervous systems, their functions. Interaction of regulatory systems of an organism. Perception of information by the nervous system. Sensor systems. The connection of the human body with the external environment. General characteristics of sensor systems. Structure of analyzers. Visual and auditory sensory systems. Sensory systems of taste, smell, balance, movement, touch, temperature, pain. Formation of human behavior and psyche. Reticular formation of the brain and levels of perception of information. Sleep. Biorite. The structure of instinctive behavior, its modification. Types of training. Memory. Types of memory. Acquired behavior. Thinking and consciousness. Thinking and the cortex of the cerebral hemispheres. Functional asymmetry of the brain. Language. Individual features of human behavior. The character of man. Consciousness.

Reproduction and individual development of organisms. Reproduction, their biological significance. Sexual reproduction and its forms. Structure and processes of germ cell formation. Heterosexual and hermaphroditic organisms. Fertilization and its forms. Parthenogenesis. Stages of individual development of organisms. Features of ontogenesis of animals. Embryonic (embryonic) stage. Crushing and blastula formation. Formation of a tour. Differentiation of cells, tissues and organs during embryonic development (histogenesis and organogenesis). Post-embryonic development, its stages and types in animals. Growth and its types. Features of post-embryonic plant development. The phenomenon of regeneration and its biological significance. The concept of life cycle. Simple and complex life cycles. Alternation of sexual and asexual generations in the life cycle of higher plants and its biological significance.

Heredity and variability of organisms. Genetics - the science of patterns of heredity and variability. The main stages of genetics. Basic genetic concepts: gene, allele, recessiveness, dominance, variability, heredity, genome, genotype, phenotype. Regularities of heredity established by Mendel: the law of uniformity of first-generation hybrids (the law of dominance), the law of splitting traits, the law of independent combination of states of traits. The statistical nature of Mendel's laws of heredity. Gamete purity law. Methods of genotype testing of hybrid individuals. Deviations in splitting from the typical quantitative relations established by Mendel and their causes. Intermediate nature of inheritance, incomplete dominance, etc. Crossingover, its causes and biological significance. Genetic chromosome maps. Chromosomal theory of heredity and the role of research TH Morgan in its creation. Genetics of sex. Autosomes and sex chromosomes. Gender determination in different groups of organisms and its genetic basis. Inheritance linked to the article. Genotype as a holistic system. Gene molecular structure. Genome organization in different groups of organisms. The ratio of gene - trait. Gene interaction and its types. Multiple action of genes. Cytoplasmic heredity and its biological significance.

	<p>The role of the interaction of genotype and environmental conditions in the formation of the phenotype. Modification (non-hereditary) variability and its properties. Statistical regularities of modification variability. Hereditary variability and its types. Combinational variability and its sources. Mutational variability. Types of mutations and their causes. Mutagenic factors. Spontaneous mutations. General properties of mutations. Biological antimutation mechanisms. Significance of mutations in nature and human life. The law of homologous series of hereditary variability of organisms МІ Вавилова. Population genetics. Genetic structure of populations. Hereditary variability in natural populations. Population gene pool. Hardy-Weinberg's law. Gene drift, its causes and consequences. Human genetics. Hereditary human diseases, their causes. Diagnosis, treatment and prevention of hereditary human diseases. Medical genetics.</p>
<p>Superorganic levels of life organization.</p>	<p>Environmental factors. Organisms and habitat. Habitat and its factors. Settlement of plants in nature. Ecological groups of plants. Life forms of plants. Interaction of plants, fungi, bacteria and their role in ecosystems. Population-species level of life organization. Ecosystems. Biosphere. The noosphere.</p>
<p>Historical development of the organic world.</p>	<p>Fundamentals of evolutionary theory. Evolution. Phylogeny. Divergence, convergence, parallelism. Rudiments and atavisms. Synthetic theory of evolution. Microevolution. Species formation. Biological progress and regress.</p>

## Recommended Reading List

1. Bazanova T.I. Biology Class 9. [textbook of the general educational institution] / T.I. Bazanova, Y.V. Pavichenko, I.S. Karmazina, A.M. Titkova, V.M. Linnichenko. – Kharkiv: Svit Dytynstva; 2009 – 296 p.
2. Balan P.G. Biology. Class 10. [textbook of the general educational institution] / P.G. Balan, Y.G. Verves, V.P. Polishchuk. – K. : Heneza, 2010. – 288 p.
3. Bida O.A. Biology: handbook for applicants and students of general educational institutions [study guide] / O.A. Bida, S.I. Derii, L.M. Iliukha, L.I. Prokopenko. – K.: Letter LTD, 2012 – 488 p.
4. Bohdanova T.L. Guidebook to biology / T.L. Bohdanova, O.V. Braion, O.V. Danylova. – K.: Naukova Dumka, 2003. – 793 p.
5. Bohutska T.O. Biology test assignments for applicants to higher educational institutions (based on the standard biology curriculum for secondary schools and the program of biology entrance examinations for higher educational institutions) / T.O. Bohutska. – Kamianets-Podilskyi: Abetka-Nova, 2003. – 112 p.
6. Zadorozhnyi K.M. Botany. Zoology. Human Biology. Practice tests. / K.M. Zadorozhnyi. – Kh.: Osnova Publishing Group, 2008. – 208 p.
7. Zadorozhnyi K.M. All biology lessons. Class 9. / K.M. Zadorozhnyi. – Kh.: Osnova Publishing Group, 2009. – 287 p.
8. Ilchenko V.R. Biology Class 7. [textbook of the general educational institution] / V.R. Ilchenko, L.M. Rybalko, T.O. Piven. – Poltava: Dovkillya – K., 2007. – 258 p.
9. Kucherenko M.Y. General biology Class 11. [textbook of the general educational institution] / M.Y. Kucherenko, Y.G. Verves, P.G. Balan, V.M. Voinitsyi. – K. : Geneza, 2006. – 272 p.
10. Mezhzherin S.V. Biology Class 8. [textbook of the general educational institution] / S.V. Mezhzherin, Y.O. Mezhzherina. – K.: Osvita, 2008, – 256 p.
11. Moroziuk S.S. Biology Class 6. [textbook of the general educational institution] / S.S. Moroziuk. – Kharkiv.: 2008 – 288 p.
12. Musiienko M.M. Biology Class 7 [textbook of the general educational institution] / M.M. Musiienko, P.S. Slavnyi, P.G. Balan. – K.: Heneza, 2007. – 208 p.
13. Prysiazhniuk M.S. Human Biology Class 9. [textbook of the general educational institution] / M.S. Prysiazhniuk. – K.: Fenix, 2003. – 239 p.
14. Rys E. Introduction for molecular biology: from cells to atoms / E. Rys, M. Stenberg. – M. : Mir, 2002. – 142 p.
15. Romanenko O.V. Principles of Ecology: [study guide] / O.V. Romanenko, O.V. Kostyliov. – Kyiv. : Fitosociocenter. – 2001. – 150 p.
16. Salo T.O. Biology in tables and diagrams. Classes 10 – 11. / T.O. Salo. – Kh.: Ukrainian Book Network LLC, 2010. – 88 p.
17. Sobol V.I. Biology Class 7. [textbook of the general educational institution] / V.I. Sobol. – K.: Gramota, 2007. – 295 p.
18. Taglina O.V. Biology Class 10 [textbook of the general educational institution] / O.V. Taglina. – Kh. : Vesta, Publishing House “Ranok”, 2010. – 256 p.

19. Shabatura M.N. Human Biology Classes 8-9 [textbook]/ M.N. Shabatura, N.Y. Matiash, V.O. Motuznyi. – K. : Geneza, 2001. – 176 p.

Preparing for the exam, one can also use other effective textbooks and guidebooks to biology recommended by the Ministry of Education and Science of Ukraine. The list of textbooks recommended by the Ministry of Education and Science of Ukraine can be found on the ministry website.

## ASSESSMENT CRITERIA

The structure of admission exam for foreign citizens consists of test assignments with multiple choice, where only one answer is right. One right answer is evaluated as 10 points. The whole test consists of 20 tasks. The assessment of the test task is carried out on a 200-point scale, based on the fact that the final assessment consists of the assessment of each individual task.

Examiners sum up total examination score and record them in the examination paper and the sheet of results of entrance examinations.

Minimal amount of points for examination, that gives applicant an opportunity to take part in further admission examination and contest, is \_\_\_\_ points. It corresponds to a threshold score «pass-fail» (minimal amount of points), that is determined by Ukrainian Center for Educational Quality Assessment on the basis of External Evaluating Testing on biology in 2020.

In case, total examination score is less than 100 points out of 200, an applicant is not allowed to take part in further admission examination and contest.

An applicant that didn't show up on biology admission examination without valid excuse are not allowed to take part in further admission examination and contest.