MINISTRY OF HEALH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

«APPROVED»

Rector of ONMedU

Valery ZAPOROZHAN

«27» 03 2025

PROGRAM

OF AN ENTRANCE EXAMINATION IN THE BIOLOGY

FOR FOREIGNERS AND STATELESS PERSONS

Odesa

2025

The goal of assessment of the Biology: to evaluate the degree of preparedness ofinternational applicants in the Biology for the purpose of competitive selection for study at Odesa National Medical University.

The proposed Biology entrance exam program was created according to the basis of existing programs for secondary schools.

The contents of the tasks to assess the quality of biology knowledge of international applicants is to identify the degree of their preparation for further study at Odesa National Medical University.

The objects of control are the use of written answers to examinations questions and multiple choice questions.

The contents of the test are based on the following sections of the biology course: "Molecular level of life organization", "Cellular level of life organization" and "Organismic level of life organization".

The program was discussed and approved at the sitting of the admission board of Odesa National Medical University (Record № 3 of 19.03.2025).

The program was approved by the order of Rector of ONMedU № 171-0 of 03.03.2025

INTRODUCTION

The modern system of higher education considers general biology as a basis for the development of medicine, biotechnology and animal husbandry, and so on. With the help of knowledge of biology can be solved a number of issues such as: finding ways to overcome human diseases, stimulating the body's regenerative processes, genetic correction of defects in people with hereditary diseases, obtaining biologically active and medical substances and more.

GENERAL DESCRIPTION OF THE MAIN COMPONENTS OF THE TEST

The biology exam includes 2 types of tasks from the specified sections of the discipline. The answers require in-depth knowledge of biology to the extent determined by the secondary school program and the biology program for foreign students of the preparatory department.

Task I.

A detailed answer task. Applicants have to answer the questions in written form – task time 20 minutes.

Task II.

A multiple-choice task. Applicants have to read a question and fill the table with the correct variant (5 questions) – task time 15 minutes (2-3 min. for each question).

REQUIREMENTS FOR THE COMPETENCE OF BIOLOGY

Molecular level of life organization.

- Structure, properties and functions of organic and non-organiccompounds.
- The concept of biopolymers and their monomers.
- Proteins: structure features. Amino acids, peptides and polypeptides.Levels of structural organization of proteins.
- Nucleic acids. Structure of nucleotide. Structure, properties and functions of DNA, the principle of complementarity.
- The concept of gene.

- RNA and their types.
- ATP, the concept of macroergic bonds.

Cellular level of life organization.

- Types of cell organization (prokaryotic and eukaryotic).
- Membranes, their structure, properties and basic functions. Plasma membrane. Transport of substances across membranes.
- Cytoplasm and its components. Organelles. Single-membrane organelles, double-membrane organelles and non-membrane organelles.
- The structure and functions of the nucleus. Chromosomes, features of structure and chemical composition. Homologous chromosomes. Autosomes and sex chromosomes (heterochromosomes). Human karyotype. Chromosomal set of nucleus (haploid, diploid, polyploid).
- Cell cycle. Interphase. Mitotic cell division in eukaryotes, its phases. Meiotic cell division, its phases. Conjugation of homologous chromosomes. Crossing-over.
- Protein biosynthesis and its stages. Genetic code and its properties. Codon, anticodon, start codon, stop codons. Transcription. Genes (structural and regulatory). Exons, introns. Replication, transcription, translation.

Organismic level of life organization.

- Forms of reproduction of organisms (asexual, sexual). Parthenogenesis. Polyembryony. Sexual reproduction. Processes of germ cell formation. Fertilization and its forms. Ontogenesis. Periods of individual development of organisms. Embryonic period of development, its stages in animals.
- Genetics. Methods of genetic research (including human heredity study). Basic concepts of genetics: genes, gene allele, homozygote, heterozygote, dominant and recessive traits, genotype, phenotype, gene pool, heredity, variation, pure line.
- Patterns of heredity established by G. Mendel and their statistical nature. Gamete purity law. Methods of genotype testing of hybrid individuals. Intermediate nature of inheritance. Linked inheritance. Chromosomal theory of heredity. Genetic basis of sex determination in different groups of organisms.Sex linked inheritance.
- Variation, its forms and manifestations. Genotypic and phenotypic variation.

Evaluation criteria

for the biology entrance exam for foreign applicants

entering Odessa National Medical University in 2023.

The assessment of the applicants' level and quality of knowledge will be carried out at 200-point system. Each task is assessed with a certain number of points. The final score according to the 200-point system is assigned according to the amount of points for all the tasks.

The structure and contents of the examination card

Task I. A detailed answer task. Applicants have to answer the questions in written form – task time 20 minutes.

Applicants have to answer the each question in several sentences – task time 20 minutes. A complete response to the each question is estimated at 50 points. Foreach insignificant mistake, 5 points are withdrawn. If the answer to the question is incomplete, 20 points are withdrawn.

Task II

A multiple-choice task. Applicants have fill the table with the correct variant (5 questions) – task time 15 minutes. Each correct answer is estimated at 20 points.

Significant mistakes of biology exam:

1. Lack of knowledge of basic concepts, biological laws and regularities, basic biological processes at the molecular, cellular and organismal level of life organization.
2. Inability to substantiate conclusions, operate with concepts when explaining natural phenomena with examples from the practice of human health care.
3. Inability to write down schemes of crossing for autosomal and X-linked inheritance using generally accepted rules.
4. Inability to present factual material in a logical sequence

Insignificant errors of biology exam:

1. An error that does not affect the essence of the presented material.
2. Some of the key points of the answer are substaned insufficiently.

Table 1

Structure of the examination card and assessment of each section

Number	Structure and content test task	Answers ratings	The maximal number of points
1	An opened questions (number of questions – 2)	50 points for a detailed answer to the questions without mistakes	50 * 2 = 100
2	ple choice task – 5questions	20 points foreach correct answer	20 * 5 = 100

The maximum amount of points – 200

REFERENCES

1. Biology: textbook / R. J. Brooker; E. P. Widmaier; L. E. Graham; P. D. Stiling. – 4th ed. – NY: McGraw-Hill Education – 2021. - P.1438
2. Biology: textbook for Class XI / A. K. Rajput; S. Uppal; A. Chitkara [et al]. – 1st ed., reprinted. – New Delhi: National Council of Educational Research and Training – 2021. - P.356
3. Biology: textbook for Class XII / M. S. Anwar; S. Uppal; A. Chitkara [et al]. – 1st ed., reprinted. – New Delhi: National Council of Educational Research and Training – 2019. – P.296
4. Campbell biology / Lisa Urry, Michael Cain, Steven Wasserman, Peter Minorsky, Jane Reece. – 11th rectricted ed. – Hoboken : Pearson Higher Education, 2016.
5. Biological Science 1 & 2: Third Edition /Taylor D. J., Green N. P. O., Stout G. W. , Soper, R. [Ed.] – Cambridge: Cambridge UniversityPress - 2008. – P. 984
6. Essential Cell Biology : textbook / B.M. Alberts, D. Bray, K. Hopkin [et al]. – 4th ed., rev. and upd. – NY : Garland Publishing, Inc., 2019. – 862 p.

The Executive Secretary

of the admission board of ONMedU – Elina MOKRIENKO

Example of an examination card

VARIANT №1

Open questions:

1. What is translation?

2. Stages of mitosis and their characteristics.

Multiple-choice questions:

1. Replication of DNA occurs in:
A. G1-phase
B. Metaphase
C. Prophase
D. S-phase
E. G2-phase
2. DNA is located in:
A. Nucleus
B. Ribosome
C. Cytoplasm
D. Lysosome
E. Endoplasmic Reticulum
3. Choose the gametes, that are formed by organism with genotype AaBb:
A. AB, ab
B. AB, aB, ab
C. AB, aB, Ab, ab
D. A, a
E. B, b
4. What is absent in prokaryotic cells:
A. Membranes
B. Nucleus
C. Cytoplasm
D. Organic molecules
E. Ribosomes
5. What is the monomer of proteins?
A. Monosaccharides
B. Aminoacids
C. Nucleotides
D. Peptides
E. Lipids

Example of an answer sheet

Date: _____

ANSWER SHEET

APPLICANT'S NAME	EXAMINATION CARD#

TASK 1 (Please, write in block letters)

1_____

_____

_____

_____

_____

_____

_____

_____

_____

2._____

_____

_____

_____

_____

_____

_____

_____

_____

TASK 2

Question#	1	2	3	4	5
Answer					

MARK

Task 1 (points)	Task 2 (points)	Examination mark

Examiner first and last name **Signature**

_____ _____