# MINISTRY OF SCIENCE AND HIGHER EDUCATION

# OF THE RUSSIAN FEDERATION

# Federal State Budgetary Educational

# Institution of Higher Education

# “Astrakhan State University”

# (Astrakhan State University)

APPROVED

by Academic Council

of FSBEI HE Astrakhan State University

on October 28, 2021

(Protocol No. 3)

**PROGRAMME**

**OF IN-HOUSE ENTRANCE EXAMINATION**

**in the major**

# 06.04.01 BIOLOGY

# for entrants to the master programme

**“Biological expertise in forensic practice”**

# In 2022

**ASTRAKHAN — 2022**

## EXPLANATORY NOTE

The programme of entrance examinations contains all basic sections of each master programme and is made on the basis of the educational programme of the bachelor major *06.04.01 Biology*, provided by the corresponding Federal State Educational Standard. The program reflects the main issues of modern biological expertise in forensic and criminalistics practice.

## The purpose of the entrance examination is to:

* 1. to determine the basic level of knowledge sufficient for the proper grasping of professional training programs for a master's degree in "Biology"

1.2. Assessment of the ability to analyze modern information about humans, animals, plant objects and microorganisms (anatomy, cytology, biochemistry, molecular biology, genetics, ecology, virology) as part of their application in expert evaluation procedures of different species.

1.3 Determination of the level of readiness to apply special, physical, chemical and physical-chemical methods to search, detection, fixation, seizure and preliminary investigation of material objects to establish the facts (facts of the case) in civil, administrative and criminal proceedings;

1.4. Assessment of the entrant’s knowledge in the field of regulation and analysis of the impact of economic activities on the environment. Environmental expertise as a procedure for assessing the sufficiency of the environmental justification of the proposed economic and other activities. Ecological monitoring, its scientific basis and priority monitored parameters of natural environment. Assessment of knowledge of methods of ecological research.

## Procedure of the entrance examination:

* 1. The entrance test is conducted in the form of an interview.
	2. Duration of the entrance examination: 20 minutes for preparation, 10 to 15 minutes for an answer
	3. Evaluation system: graded, 100-point grading scale, according to the following criteria:
* knowing the factual material,
* ability to analyze theoretical ideas about the fundamental problems of the relevant biological branch,
* familiarity with the literary sources recommended for the entrance test.
	1. The committee decides on the grade by a simple vote, immediately after the entrant’s answer.

## Literature recommended to prepare for the entrance exam:

1. Lotova, L.I. Botanika. Morfologiya i anatomiya vysshih rastenij [*Botany. Morphology and anatomy of higher plants*]: The book was approved by the Ministry of Education of the Russian Federation as a textbook for students of universities studying in biology. / L.I. Lotova – 4th edition; revised – Мoscow: URSS [Librokom Book House], 2010. – 510 p.
2. Dyakov YU. T. Vvedenie v algologiyu i mikologiyu [*Introduction to algology and mycology*]: Textbook for university students … / YU. T. Dyakov– Мoscow: Moscow State University, 2000. – 190 p.
3. Burukovskij, R.N. Zoologiya bespozvonochnyh [*Zoology of invertebrates*]: Approved by the Fisheries Education Organization as a textbook for university students in the field of “Aquatic Bioresources and Aquaculture” / R. N.. Burukovskij. – St. Petersburg : Prospekt Nauki, 2010. - 960 p.
4. Konstantinov, V.M. Sravnitelnaya anatomiya pozvonochnyh zhivotnyh [*Comparative anatomy of vertebrate animals*]: Approved by the AMA for pedagogical education as a textbook for universities in 032400 "Biology" speciality / V.M. Konstantinov, S. P. Shatalova. - Moscow: Academia , 2005. - 304 p.
5. Sudebnaya medicina: lekcii [*Forensic Medicine: Lectures*] / V.S. Paukov. - Мoscow: Norma: NITS Infra-M, 2012. - 288 p.
6. Pigolkin YU.I., Dubrovin I.A. Sudebnaya medicina [*Forensic Medicine*]. Compendium: textbook. - Moscow: GEOTAR-Media, 2011. - 288 p.
7. Voronkov N.A. Osnovy obshchej ekologii [*Fundamentals of general ecology*]. Мoscow, 1997. 457 p.
8. Ivanov V. I. Genetika [*Genetics* ]/ Ivanov V. I. Baryshnikova N. V.; Bileva Dzh. S.; Dadali E. L.; Konstantinova L. M.; Kuznecova O. V.; Polyakov A. V. Textbook for universities/ Edited by the member of RAS V.I. Ivanov. - Moscow: ICC “Akamedkniga”, 2007. - 638 p.
9. ZHimulev, I.F. Obshchaya i molekulyarnaya genetika [*General and molecular genetics*]. Novosibirsk: Sib. univ. publ., 2007. - 479 p.
10. Nikolajkin, N.I. Ekologiya [*Ecology*]: Recommended by the Scientific-Methodical Council on Ecology of the Ministry of Education and Science of the Russian Federation as a textbook for university students - Moscos: Academia, 2012. – 572 p.
11. Brodskij, A.K. Ekologiya [*Ecology*]: Approved by the AMA on Classical University Education as a textbook for bachelor students in Biology, Ecology and Nature Management / А. К. Brodskij. - Moscow: KNORUS, 2012. - 272 p.
12. Fiziologiya cheloveka i zhivotnyh [*Human and Animal Physiology*] / V.YA. Apchel, YU.V. Darinskij. – Moscow: Publishing House Centre “Academia”, 2011. – 448 p.
13. Kolesnichenko, P.G. Issledovanie ekologicheskogo sostoyaniya pochvenno-geologicheskih obektov [*Study of ecological state of soil and geological objects*] / P.G. Kolesnichenko Bulletin of the Volgograd Academy of the Ministry of Internal Affairs of Russia. – Volgograd: Publishing House of the Volgograd Academy of the Ministry of Internal Affairs of Russia, 2009. – No. 3 (10). – p. 16–19.
14. Borisova, V.V. Diagnostika gribov po ih citologicheskim elementam [*Diagnosis of fungi by their cytological elements*] / V.V. Borisova // Theory and practice of forensic examination. – Мoscow: FBE RFCFS of the Ministry of Justice of the Russian Federation, 2010. – No. 3 (19). – P. 119–124.

## List of questions based on bachelor programmes in relevant areas.

***Master programme “Biological expertise in forensic practice”***

* 1. Establishing the type of biocenosis. Determination of the state of balance of the populations of plants and animals that make up the biocenosis. Accounting for intraspecific and interspecific competition.
	2. Physical and morphological properties of soils. Methods to study chemical properties of soils.
	3. Mineralogical composition of soils. Chemical composition of soils.
	4. Types of biological systems and history of their development. Modern systems of living organisms.
	5. Taxonomic categories of plant systematics (basic and intermediate).
	6. General characteristics and classification of the kingdom of fungi.
	7. Systematics of animals. The main taxonomic groups. Principles of systematics of animals in ecology.
	8. Inferior plants. The concept of lower plants. Divisions of lower plants in the past and present. Peculiarities of the position of the division Green algae among other divisions of algae.
	9. The kingdom of fungi. Distinguishing features of fungi from other organisms. Structure of vegetative body and cell. The importance of fungi in nature and human life.
	10. Lichens. Lichens phycobionts and mycobionts, their systematic position and relationships. Lichens of Astrakhan region. Distribution and role of lichens in nature and human life.
	11. Higher plants. Concept of higher plants and division into divisions. The lines of the reproductive cycle in the higher plants.
	12. Lycopodiophyta. Appearance and time of flowering of Lycopodiophyta. Distinguishing features and structure of vegetative and reproductive organs.
	13. Equisetophyta. Emergence and time of blooming. Distinguishing features in the structure of vegetative and reproductive organs.
	14. Ferns. Emergence and time of blooming. Distinguishing features in the structure of vegetative and reproductive organs.
	15. Gymnosperms. Emergence and time of blooming. Distinguishing features in the structure of vegetative and reproductive organs. Classification.
	16. Magnoliophyta. Emergence and time of blooming. Distinguishing features in the structure of vegetative and reproductive organs.
	17. Cartilaginous fish. General characteristics of the class. Primitive and progressive features of organization of cartilaginous fish diversity. Distribution and ecology. Economic significance.
	18. Bony fish. Characteristics of the class. The multiplicity and diversity of bony fishes. Distribution.
	19. Birds. General characteristics of birds as a progressive class of higher vertebrates that have adapted to flight. Commercial birds. Domestic birds and their origin.
	20. Mammals or animals. General characteristics of the class. Classification. Conditions of existence and general distribution. The main ecological types of animals.
	21. Reptiles. Classification. Specifics of morphological organization of different groups of reptiles. Conditions of existence and general distribution.
	22. Amphibians. General characteristic of the class in connection with the amphibian way of life. Diversity of modern amphibians.
	23. General characteristics of human body tissues. Classification of tissues.
	24. Basic statements of cellular theory. Pro- and eukaryotic organization of cells. Animal, plant and bacterial cells.
	25. Variability and its types. Basic propositions of mutation theory. Classification and mechanism of mutations. Mutagens and mutation process. Genetic load in human population.
	26. Structure and function of proteins. Concept of peptide bonding. Concept of conformation.
	27. Enzymes: structure, properties, classification. Mechanism of action of enzymes and enzymatic kinetics.
	28. Structure and biological role of carbohydrates. Mono-, oligo- and polysaccharides. Carbohydrates as energy carriers in the cell.
	29. Structure, properties and classification of lipids. The role of lipids in the structure of biological membranes.
	30. The concept of habitat. Environmental factors and their classification.
	31. Light as an environmental factor. The role of light in the life of animals and plants. Ecological groups of plants and animals in relation to light and their adaptive features.
	32. Temperature as an ecological factor. The main ways of regulation of heat exchange in plants and animals.
	33. Humidity. Ecological groups of plants and animals according to water balance. Methods to regulate water balance.
	34. Specifics of aquatic habitat. Density, pressure, salinity, oxygen regime. Adaptations of living organisms in aquatic environment.
	35. Features of the land-air environment. Main set of factors and ways of adaptation of living organisms to them.
	36. Soil as a habitat. Specifics of soil as a three-phase system. Ecological groups of soil animals.
	37. Population. Structure of population. Homeostasis of populations.

38. The concept of a biocenosis. Biotope. Ecological niche. Relationships of organisms in a biocenosis. The concept of ecosystems. Teaching about biogeocenosis.

39. Problems of anthropogenesis. Man's place in zoological system. Main stages of anthropogenesis (ancient humans, ancient humans, modern humans). 40.

40. The concept of monitoring, its types. Environmental monitoring, its types and systems.

# The main criteria for evaluating the answer of an entrant

1. correspondence of the answer to the question posed; completeness and extensiveness of the answer to the question;
2. presence or absence of mistakes in the answer;
3. logic of the answer to the question; the correctness and appropriateness of the use of the terminology of the discipline;
4. use in the answer of examples from practice, diagrams, drawings; clarity of the answer.

# 6. Correlation of the criteria for evaluating an entrant’s answer and levels of knowledge

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| ***Levels and sublevels of knowledge*** | ***Number of points*** |
| ***1. Knowing the factual material*** | **25** |
| 1) complete meaningful presentation of the material | 25-20 |
| 2) sufficient understanding of the presented material with occasional inaccuracies | 19-10 |
| 3) knowing separate sections of physiology course | 9-5 |
| 4) lack of knowledge about the essence of physiological phenomena and their mechanisms | 4-0 |
|  |  |
| ***2. Ability to analyze theoretical ideas about fundamental problems of physiology involving knowledge about the control mechanisms of vital functions and physiological systems:*** | 25 |
|  1) a complete presentation of ideas with some gaps in knowledge | 20-25 |
|  2) sufficient understanding of the presented knowledge with inaccuracies in the presentation of factual material | 19-10 |
|  3) knowledge of separate elements of definitions and concepts | 9-5 |
|  4) lack of important concepts and their elements | 4-0 |
|  |  |
| ***3. The ability to think critically about a scientific problem, that is of debatable nature:*** | **25** |
| 1) full presentation of factual material and its critical comprehension | 25-20 |
| 2) sufficient capacity for critical analysis with occasional inaccuracies | 19-10 |
| 3) knowledge of individual problems, with shortcomings of critical analysis | 9-5 |
| 4) lack of knowledge | 4-0 |
| ***4. Familiarity with the literary sources recommended for preparing for entrance exams*** | **25** |
| 1) complete familiarity with the theoretical material of the recommended literary sources | 25-20 |

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| --- | --- |
| 2) sufficient level of understanding of the literary material with some deficiencies in depth of understanding of the material | 19-10 |
| 3) material knowledge of only selected literary sources, recommended for test preparation | 9-5 |
| 4) lack of familiarity with the recommended literature sources | 4-0 |
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