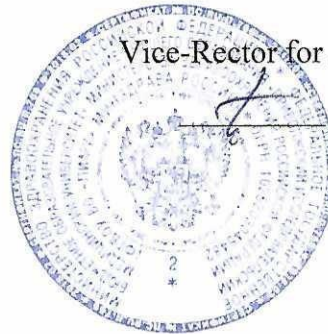


Federal State Budgetary Educational Institution of Higher Education  
"Privolzhsky Research Medical University"  
Ministry of Health of the Russian Federation



APPROVED

Vice-Rector for Academic Affairs

E.S. Bogomolova

31 August 2021

## WORKING PROGRAM

Name of the academic discipline: **BIOLOGY**

Specialty: **31.05.01 GENERAL MEDICINE**  
(code, name)

Qualification: **GENERAL PRACTITIONER**

Department: **BIOLOGY**

Mode of study: **FULL-TIME**

Labor intensity of the academic discipline: **216 academic hours**

Nizhny Novgorod  
2021

The working program has been developed in accordance with the Federal State Educational Standard for the specialty **31.05.01 GENERAL MEDICINE**, approved by Order of the Ministry of Science and Higher Education of the Russian Federation No. 988 dated 12.08.2022.

**Developers of the working program:**

Moskovtseva Olga Mikhailovna, associate professor of the Department of Biology, PhD.

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Kalashnikov Ilya Nikolaevich, Head of the Biology Department PRMU, PhD

Nikitina Juliya Victorovna, associate professor of the Department of Biology, PhD.

The program was reviewed and approved at the department meeting (protocol № 8, August, 26, 2021).

Head of the Department of biology, PhD



I.N.Kalashnikov

(signature)

August, 26,2021

AGREED

Deputy Head of EMA ph.d. of biology



Lovtsova L.V.

(signature)

August, 26,2021

## **1. The purpose and objectives of mastering the academic discipline Biology (hereinafter – the discipline):**

1.1. The purpose of mastering the discipline: participation in forming the relevant competencies

UC-1. Able to carry out a critical analysis of problem situations based on a systematic approach, develop an action strategy

GPC-10. Able to understand the principles of modern information technologies and use them to solve the tasks of professional activity

### **1.2. Tasks of the discipline:**

### **1.3. Requirements to the deliverables of mastering the discipline**

As a result of completing the discipline, the student should

#### **Know:**

- general patterns of origin and development of life, properties of biological systems;
- basic patterns of evolutionary transformation of organs and systems of human organs;
- the laws of genetics and its significance for medicine; modern methods of studying human genetics; principles of medical genetic counseling;
- patterns of heredity and variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multifactorial diseases;
- influence on the human body of biotic, abiotic and social factors.

#### **Be able to:**

- use educational, scientific, popular science literature, the Internet for professional activities;
- use laboratory equipment, work with a microscope;
- in the form of generalized schemes to display the processes occurring in the cell;
- solve problems in molecular genetics (DNA reduplication, protein biosynthesis);
- schematically depict chromosomes; using these notations, solve problems for mitosis, meiosis, gametogenesis;
- compose and analyze ideograms using the Denver Chromosome Classification System;
- solve problems in genetics - on the interaction of genes, linked inheritance, sex-linked inheritance, etc.
- compile pedigrees using standard notation; analyze pedigrees;
- explain the causes and possible mechanisms of the birth of children with chromosomal diseases;
- explain the nature of deviations in the course of development, leading to the formation of variants, anomalies and defects;
- to identify human parasites on micro- and macropreparations;
- solve situational problems in parasitology.

#### **Possess:**

- methods of information transformation: text, spreadsheet editors, Internet search;
- skills of displaying the studied objects in drawings and diagrams;
- principles of identification of objects on micro- and macropreparations to substantiate the logical sequence of evolutionary events, stages of embryogenesis, levels of organization of genetic material and processes of realization of genetic information, stages of development of parasites.
- methods for interpreting idiograms based on the Denver classification of chromosomes and methods for studying human genetics aimed at diagnosing and assessing the risk of hereditary diseases in a population.

## **2. Position of the academic discipline in the structure of the General Educational Program of Higher Education (GEP HE) of the organization.**

**2.1.** The discipline Biology refers to the core part (or the part formed by the participants of educational relations) of Block 1 of GEP HE (Academic discipline index). The discipline is taught in 1 and 2 semester/1-st year of study.

**2.2. The following knowledge, skills and abilities formed by previous academic disciplines are required for mastering the discipline:**

1. biology (school course)
2. chemistry (school course)

**2.3. Mastering the discipline is required for forming the following knowledge, skills and abilities for subsequent academic disciplines:**

1. biology,
2. microbiology,
3. biological chemistry,
4. pharmacognosy,
5. pharmacology,
6. physiology.

**3. Deliverables of mastering the academic discipline and metrics of competence acquisition**

Mastering the discipline aims at acquiring the following universal (UC) or/and general professional (GPC) or/and professional (PC) competencies

№	Competence code	The content of the competence (or its part)	Code and name of the competence acquisition metric	As a result of mastering the discipline, the students should:		
				Know	be able to	possess
1.	UC-1	Able to carry out a critical analysis of problem situations based on a systematic approach, develop an action strategy	IUC-1.1 Knows: methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis IUK 1.2 is able to: gain new knowledge based on analysis, synthesis, etc.; collect data on complex scientific problems related to the professional field; search for information and solutions based on actions, experiment and experience IUK 1.3 Has practical experience: research of the problem of professional activity with the use	- general patterns of origin and development of life, properties of biological systems; - basic patterns of evolutionary transformation of organs and systems of human organs; - the laws of genetics and its significance for medicine; modern methods of studying human genetics; principles	- use educational, scientific, popular science literature, the Internet for professional activities; - use laboratory equipment, work with a microscope; - in the form of generalized schemes to display the processes occurring in the cell; - solve problems in molecular genetics (DNA reduplication, protein biosynthesis)	- methods of information transformation : text, spreadsheet editors, Internet search; - skills of displaying the studied objects in drawings and diagrams; - principles of identification of objects on micro- and macropreparations to substantiate the logical sequence of evolutionary events, stages of embryogenesis, levels of organization of genetic material and

			<p>of analysis, synthesis and other methods of intellectual activity; development of an action strategy for solving professional problems</p>	<p>of medical genetic counseling;  - patterns of heredity and variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multifactorial diseases;  - influence on the human body of biotic, abiotic and social factors.</p>	<p>s);  - schematically depict chromosomes; using these notations, solve problems for mitosis, meiosis, gametogenesis;  - compose and analyze ideograms using the Denver Chromosome Classification System;  - solve problems in genetics - on the interaction of genes, linked inheritance, sex-linked inheritance, etc.  - compile pedigrees using standard notation; analyze pedigrees;  - explain the causes and possible mechanisms of the birth of children with chromosomal diseases;  - explain the nature of deviations in the</p>	<p>processes of realization of genetic information, stages of development of parasites.  - methods for interpreting idiograms based on the Denver classification of chromosomes and methods for studying human genetics aimed at diagnosing and assessing the risk of hereditary diseases in a population.</p>
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					course of development, leading to the formation of variants, anomalies and defects; - to identify human parasites on micro- and macropreparations; - solve situational problems in parasitology.	
2.	GPC-10	Able to understand the principles of modern information technologies and use them to solve the tasks of professional activity	IOPK 10.1 Knows: the capabilities of reference information systems and professional databases; methods of information retrieval, information and communication technologies; modern medical and biological terminology; fundamentals of information security in professional activities IOPK 10.2 is able to: apply modern information and communication technologies to solve the tasks of professional activity; carry out an effective search for information necessary to solve the tasks of professional activity using	- general patterns of origin and development of life, properties of biological systems; - basic patterns of evolutionary transformation of organs and systems of human organs; - the laws of genetics and its significance for medicine; modern methods of studying human genetics; principles of medical genetic counseling; - patterns of heredity and	- use educational, scientific, popular science literature, the Internet for professional activities; - use laboratory equipment, work with a microscope; - in the form of generalized schemes to display the processes occurring in the cell; - solve problems in molecular genetics (DNA reduplication, protein biosynthesis); - schematically depict chromosomes; using	- methods of information transformation: text, spreadsheet editors, Internet search; - skills of displaying the studied objects in drawings and diagrams; - principles of identification of objects on micro- and macropreparations to substantiate the logical sequence of evolutionary events, stages of embryogenesis, levels of organization of genetic material and processes of realization of genetic information, stages of development

			<p>reference systems and professional databases; use modern medical and biological terminology; master and apply modern information and communication technologies in professional activity, taking into account the basic requirements of information security</p> <p>IOPK 10.3 Has practical experience in the use of modern information and bibliographic resources, the use of special software and automated information systems.</p>	<p>variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multifactorial diseases;</p> <p>- influence on the human body of biotic, abiotic and social factors.</p>	<p>these notations, solve problems for mitosis, meiosis, gametogenesis;</p> <p>- compose and analyze ideograms using the Denver Chromosome Classification System;</p> <p>- solve problems in genetics - on the interaction of genes, linked inheritance, sex-linked inheritance, etc.</p> <p>- compile pedigrees using standard notation; analyze pedigrees;</p> <p>- explain the causes and possible mechanisms of the birth of children with chromosomal diseases;</p> <p>- explain the nature of deviations in the course of development, leading to the formation of variants,</p>	<p>of parasites.</p> <p>- methods for interpreting ideograms based on the Denver classification of chromosomes and methods for studying human genetics aimed at diagnosing and assessing the risk of hereditary diseases in a population.</p>
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					<p>anomalies and defects;  - to identify human parasites on micro- and macropreparations;  - solve situational problems in parasitology.</p>
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#### 4. Sections of the academic discipline and competencies that are formed when mastering them

№	Competence code	Section name of the discipline	The content of the section in teaching units
1		Cell Biology	<p>Biology is the science of wildlife. The general patterns of existence and development of organisms. The main stages in the development of biology, the relationship of biology with other sciences. Levels of organization of living matter. A plant and an animal cells. Structure and functions of organelles. Unicellular and multicellular organisms.  Light microscope.</p>
2	UC-1 GPC-10	Fundamentals of medical parasitology	<p>Introduction to zoology. Zoology and medicine. Forms of interaction between organisms. Parasitism. Adaptation to parasitic way of life. Effects of parasites upon the host. Medical protozoology and helminthology. Important groups of parasites. Methods of prevention of parasitic diseases. Natural focus of parasitic infection.  Pavlovsky's theory on the natural focus of vector-borne diseases. Components of the natural focuses.</p> <p><b>1. Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa.</b> Main features of kingdom Protista. Main features of phyla and subphyla from the kingdom.  Geoprotists: <i>Entamoeba histolytica</i>, <i>Lambliia intestinalis</i>, <i>Balantidium coli</i>, <i>Trichomonas vaginalis</i>  Bioprotists: <i>Leshmania tropica</i>, <i>Leshmania donovany</i>, <i>Trypanosoma cruzi</i>, <i>Trypanosoma brucei</i>, <i>Toxoplasma gondii</i>, <i>Plazmodium species</i>.</p> <p><b>2. Kingdom Animalia.</b>  <b>Phylum Platyhelminthes.</b>  <b>Class Trematoda.</b> Main features of Trematodes.  Trematodes: <i>Fasciola hepatica</i>, <i>Opistorchis felineus</i>, <i>Paragonimus westermani</i>, <i>Dicrocoelium dendriticum</i>, <i>Schistosoma sp.</i>  <b>Class Cestoda.</b> Main features of Cestodes.  Cestodes: <i>Diphyllobothrium latum</i>, <i>Taenia saginata</i>, <i>Taenia solium</i>, <i>Hymenolepis nana</i>, <i>Echinococcus granulosus</i> and <i>multilocularis</i>.</p>



		<p><b>Phylum Nematelminthes</b>  <b>Class Nematoda.</b> Main features of Nematodes.  Nematodes: <i>Ascaris lumbricoides</i>, <i>Enterobius vermicularis</i>, <i>Trichuris trichiura</i>, <i>Trichinella spiralis</i>, <i>Strongyloides stercoralis</i>, <i>Ancylostoma duodenale</i>, <i>Dracunculus medinensis</i>, <i>Wuchereria bancrofti</i>, <i>Loa Loa</i>, <i>Onchocerca volvulus</i>, <i>Brugia malayi</i></p> <p><b>3. Kingdom Animalia.</b>  <b>Phylum Arthropoda.</b>  Medical importance of arthropods. Characteristics of phylum Arthropoda. Vector-borne diseases and non vector-borne diseases. Medical importance of Arthropods. Poisonous Chelicerate. Medical importance of mosquitoes. Morphological structure of Anopheles and Culex mosquitoes. Medical importance of ticks. Morphological structure of <i>Ixodes persulcatus</i>, <i>Ornithodoros papillipes</i>, <i>Sarcoptes scabiei</i>, <i>Demodex folliculorum</i>. Life cycles with complete and incomplete metamorphosis. Stages of life cycles of lice, fleas, cockroaches, fly. Biological and mechanical vectors of human diseases (bugs, lice, fleas, cockroaches, flies). <i>Pediculus humanus</i>, <i>Phthirus pubis</i>, <i>Xenopsylla cheopis</i>, <i>Wohlfahrtia magnifica</i>, <i>Blatta orientalis</i>, <i>Triatominae</i> bugs, <i>Cimex lectularius</i>, <i>Anopheles</i> and <i>Culex</i> mosquitoes.</p>
3	Molecular bases of heredity	<p>DNA structure: ribonucleic acids, deoxyribonucleic acids. Primary, secondary, tertiary structure of nucleic acids. Nucleotide structure: monomers of DNA and RNA.</p> <p>DNA Replication and Recombination. Mechanism of prokaryotic and eukaryotic DNA-replication. The Meselson-Stahl experiments. Mutations. Types of gene mutations.</p> <p>Storage and Expression of Genetic Information.</p> <p>Central dogma. Genetic code. Properties of the genetic code.</p> <p>Mechanism of protein synthesis in prokaryotes and eukaryotes.</p> <p>Transcription. Enzymes of transcription. Transfer RNA, ribosomal RNA, messenger RNA, small nuclear RNA. pre-mRNA, mature mRNA.</p> <p>Translation. Proteins: The End Product of Genetic Expression.</p> <p>Activating enzymes. Differences between bacterial and Eukaryotic protein synthesis.</p> <p>Regulation of gene expression in prokaryotes and eukaryotes.</p> <p>Lactose operon, regulation of different steps of eukaryotic gene expression.</p>
4	Classical genetics Mendelian Genetics. Morgan's theory. Chromosome theory.	<p>Heredity. Variability. Statistical method of G.Mendel. Mendel's Laws. Chromosome theory. Gene interactions. Inheritance of blood groups. Linkage: complete and incomplete linkage. Crossing Over. The phenomenon of linkage. Linkage groups and chromosomes. The phenomenon of crossing over. Explanation of crossing-over. The significance of crossing-over. Locating genes on chromosomes. Genetic maps of chromosomes.</p> <p>Mutations. Types of chromosomal and genome mutations. Diseases which are results of chromosomal and genome mutations.</p>
5	Ontogenesis and phylogenesis	<p>Cell Division. Morphology and chemical composition of chromosomes. Chromosome number. Haploidy and diploidy. Different types of reproduction. The five phases of the cell cycle.</p>

			Interphase. Mitosis. Structure and function of hereditary material during the cell cycle. Peculiarities of the human cell cycle. Meiosis and Sexual Reproduction. Spermatogenesis and Oogenesis. Stages of gametogenesis. Meiosis. Phases of meiosis. The Significance of Meiosis. Genetic regulation of the cell cycle.
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### 5. Volume of the academic discipline and types of academic work

Type of educational work	Labor intensity		Labor intensity (AH) in semesters	
	volume in credit units (CU)	volume in academic hours (AH)	1	2
Classroom work, including	3	108		
Lectures (L)	0.7	24	14	10
Laboratory practicum (LP)*				
Practicals (P)	2.3	84	40	44
Seminars (S)				
Student's individual work (SIW)	3	72	36	36
Mid-term assessment				
credit/exam ( <i>specify the type</i> )				36
<b>TOTAL LABOR INTENSITY</b>	<b>6</b>	<b>216</b>	<b>90</b>	<b>126</b>

### 6. Content of the academic discipline

#### 6.1. Sections of the discipline and types of academic work

№	Name of the section of the academic discipline	Types of academic work* (in AH)					
		L	LP	P	S	SIW	total
1	Cell Biology	2		3		8	13
2	Fundamentals of medical parasitology	6		37		20	63
3	Molecular bases of heredity	4		14		15	33
4	Classical genetics	6		16		15	37
5	Ontogenesis and phylogenesis	6		14		14	34
	<b>TOTAL</b>	<b>24</b>		<b>84</b>		<b>72</b>	<b>180</b>

\* - L – lectures; LP – laboratory practicum; P – practicals; S – seminars; SIW – student's individual work.

#### 6.2. Thematic schedule of educational work types:

##### 6.2.1 Thematic schedule of lectures

№	Name of lecture topics	Volume in AH	
		semester 1	semester 2
1	Biology is the science of life, the general patterns of existence and development of organisms. The main stages in the development of biology, the relationship of biology with other sciences.	4	
2	Fundamentals of medical parasitology. Parasitism as a form of biotic connections. Relationship between parasite and host. Introduction to medical protistology.	2	
3	Fundamentals of medical helminthology. The role of Academician K. I. Skryabin in the creation and development of medical helminthology. Teachings of Academician E. N. Pavlovsky about the natural foci of vector-borne disease.	2	

4	Molecular bases of heredity. DNA replication. Gene expression during protein biosynthesis and its regulation.	4	
5	Introduction to genetics. Classic Genetics. Mendelian Genetics. Morgan's theory. Chromosome theory.	2	
6	Genetic engineering, its tasks, methods, prospects for use.		2
7	Biology of reproduction. Biological aspect of human reproduction. Ontogenesis. Human development. Molecular genetic mechanisms of development. teratogenic factors. Cloning is reproductive, therapeutic.		4
8	Evolution. Pre- Darwinian thoughts. The main statements of Darwin's theory. Modern theory of evolution.		2
9	The subject matter of ecology. Ecological crisis. Global warming. Acid Rain. Ozone Hole. Deforestation.		2
	TOTAL (total - AH)	14	10

**6.2.2. The thematic plan of laboratory practicums** (if this type of classes is stipulated in the curriculum)

№	Name of laboratory practicums	Volume in AH	
		semester	semester
1	Domain Eukaryote. A plant and an animal cells. Light microscope. Definitions of the main terms of parasitology. Pavlovsky's theory on the natural focus of vector-borne diseases.	3	
2	Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa. Phylums: - Sarcomastigophora, - Ciliophora. Geoprotists.	3	
3	Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa. Phylum: - Sarcomastigophora, Bioprotists.	3	
4	Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa. Phylum: - Apicomplexa, Bioprotists.	3	
5	<b>The test-control on the topic "Organization of life. Cell structure. Medical protozoology"</b>	2	
6	Kingdom Animalia Phylum Platyhelminthes: - Class Trematoda	3	
7	Kingdom Animalia	3	

	Phylum Platyhelminthes: - Class Cestoda		
8	Kingdom Animalia Phylum Nemathelminthes Class Nematoda1	3	
9	Kingdom Animalia Phylum Nemathelminthes Class Nematoda 2	3	
10	<b>The test-control on the topic “Medical Helminthology”</b>	2	
11	Domain Eukaryote. Kingdom Animalia. Phylum Arthropoda. Medical impotence of arthropods. Ticks.	3	
12	Domain Eukaryote. Kingdom Animalia. Phylum Arthropoda. Medical impotence of arthropods. Arthropods are vectors for human diseases. Fleas, lice, flies, bugs, cocroaches.	3	
13	Domain Eukaryote. Kingdom Animalia. Phylum Arthropoda. Medical impotence of arthropods. Mosquitoes Culex, Anopheles.	3	
14	<b>The test-control on the topic “Arthropoda and human diseases”</b>	3	
15	Molecular basis of heredity. Nucleic acids. RNA, DNA.		3
16	DNA replication. DNA repair. Solving of the problems.		3
17	Expression of Genetic information. Transcription. Processing.Solving of the problems		3
18	Expression of Genetic information. Translation. Solving of the problems		3
19	<b>The test-control on the topic “Molecular genetics”</b>		2
20	The Cell Cycle. Mitosis. Solving of the problems		3
21	Meiosis. Solving of the problems		3
22	Gametogenesis. Ontogenesis. Solving of the problems		3
23	<b>The test-control on the topic “The test-control on the topic “Individual development of organisms. Ontogenesis”</b>		3
24	Mendelian Genetics. Mono- and dihybrid cross		3
25	Interaction of allelic genes. Solving of the problems		3
26	Interaction of non-allelic genes. Solving of the problems		3
27	Sex Determination. Sex Linkage. Solving of the problems		3
28	Crossingover. Solving of the problems		3
29	<b>The test-control on the topic “Classical genetics”</b>		3
	<b>TOTAL (total - AH)</b>	<b>40</b>	<b>44</b>

**6.2.3. Thematic plan of practicals:**

This type of classes is not stipulated in the curriculum.

**6.2.4. Thematic plan of seminars**

This type of classes is not stipulated in the curriculum.

**6.2.5. Types and topics of student's individual work (SIW)**

№	Types and topics of SIW	Volume in AH	
		1 semester	2 semester
	work with lecture material, providing for the development of lecture notes and educational literature	4	3
	search (selection) and review of literature and electronic sources of information on an individually given course problem	3	3
	doing homework for class;	4	5
	performance of home control work (problem solving, on-line testing);	2	2
	study of the material submitted for independent study (separate topics);	12	12
	preparation for laboratory work, practical and seminar classes;	5	5
	preparation for control work;	6	6
	<b>TOTAL (total - AH)</b>	<b>36</b>	<b>36</b>

**7. Types of assessment formats for ongoing monitoring and mid-term assessment**

№	Se me ster No.	Types of control	Name of section of academic discipline	Competence codes	Assessment formats		
					types	number of test questions	number of test task options
1.	1	Control of mastering the topic	Organization of life. Cell structure. Medical protozoology	UC-1 GPC-10	On-line tests Case-task Multi-level tasks and tasks	45	10
	1	Control of mastering the topic	Medical Helminthology	UC-1 GPC-10	On-line tests Case-task Multi-level tasks and tasks	45	10
	1	Control of mastering the topic	Arthropoda and human diseases	UC-1 GPC-10	On-line tests Case-task Multi-level tasks and tasks	45	10

	2		Control of mastering of the topic	Molecular genetics	UC-1 GPC-10	On-line tests Case-task Multi-level tasks and tasks	45	25
	2		Control of mastering of the topic	Classical genetics	UC-1 GPC-10	On-line tests Case-task Multi-level tasks and tasks	30	30
	2		Control of mastering of the topic	Ontogenesis	UC-1 GPC-10	On-line tests Case-task Multi-level tasks and tasks	30	25
2.		Mid-term assessment	Exam/ Credit	All sections of the discipline	UC-1 GPC-10	Oral exam	240	110

## 8. Educational, methodological and informational support for mastering the academic discipline (printed, electronic publications, the Internet and other network resources)

### 8.1. Key literature references

№	Name according to bibliographic requirements	Number of copies	
		at the department	in the library
	Shcherbatyuk, T. G. General biology. Introduction to medical parasitology = Общая биология. Введение в медицинскую паразитологию : Handbook for international student / T. G. Shcherbatyuk. – N. Novgorod : Publishing House of Privolzhskiy Research Medical University, 2019. – 268 p. : il. – ISBN 978-5-7032-1335-3.		300
	Shcherbatyuk, T. G. General biology. Introduction to medical parasitology = Общая биология. Введение в медицинскую паразитологию : handbook for international students / T. G. Shcherbatyuk. – N. Novgorod : Publishing House of Privolzhskiy Research Medical University, 2019. – URL: <a href="http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=197051&amp;idb=0">http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=197051&amp;idb=0</a>	Electronic	

### 8.2. Further reading

№	Name according to bibliographic requirements	Number of copies	
		at the department	in the library
	General biology. Part 1 : Cell cycle. Molecular genetics : handbook for international students / O. M. Moskovtseva, E. S. Klintsova, T. G. Scherbatyuk, L. V. Varshavskaya. – N. Novgorod : Publishing House		127

	of NNSMA, 2012.		
	General biology. Part 1. Cell cycle. Molecular genetics = Общая биология. Часть 1. Клеточный цикл. Молекулярная генетика : handbook for international students / E. S. Klintsova, O. M. Moskovtseva, Nizhny Novgorod State Medical Academy [et al.]. – N. Novgorod : Publishing House of NNSMA, 2012. – URL: <a href="http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=166339&amp;idb=0">http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=166339&amp;idb=0</a>	Electronic	
	General biology. Part 2 : Classical genetics / O. M. Moskovtseva, E. S. Klintsova, T. G. Scherbatyuk, L. V. Varshavskaya / Nizhny Novgorod State Medical Academy. – N. Novgorod : Publishing House of NNSMA, 2012.		123
	General biology. Part. 2 : Classical genetics = Общая биология. Часть 2. Классическая генетика / E. S. Klintsova, O. M. Moskovtseva, T. G. Scherbatyuk, L. V. Varshavskaya. – N. Novgorod : Publishing House of NNSMA, 2012. – URL: <a href="http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=166361&amp;idb=0">http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=166361&amp;idb=0</a>	Electronic	
	General biology. Part3 : Introduction to Medical Parasitology. 3 / Nizhny Novgorod State Medical Academy ; E. S. Klintsova, O. M. Moskovtseva, T. G. Scherbatyuk, L. V. Varshavskaya. – N. Novgorod : Publishing House of NNSMA, 2013. – 255 p.		144
	General biology. Part 3. Introduction to Medical Parasitology = Общая биология. Часть 3. Введение в медицинскую паразитологию / E. S. Klintsova, O. M. Moskovtseva, T. G. Scherbatyuk, L. V. Varshavskaya. – N. Novgorod : Publishing House of NNSMA, 2013. – URL: <a href="http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=165742&amp;idb=0">http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&amp;id=165742&amp;idb=0</a>	Electronic	
	Toole, G. New understanding biology for advanced level / G. Toole, S. Toole ; Toole Glenn ; Toole Susan. – 4th ed. – Nelson thornes, 1999. – 698p. : мяг. – ISBN 0-7487-3957-2.		51
	Markell and voge's medical parasitology / E. K. Markell, D. T. John, W. Krotoski. – 8th ed. – W.B. Saunders Company, 1999. – 501 с. : ил. – ISBN 0-7216-7634-0.		15
	Color atlas of genetics / E. Passarge. – 3rd ed. – Stuttgart : Thieme, 2007. – 486 с. : ил. мяг. – ISBN 978-3-13-100363-8.		11
	Medical genetics / M. J. Bamshad, J. C. Carey, L. B. Jorde, R. L. White. – 3rd ed. – St. Louis : Mosby, 2006. – 363 с. : ил. мяг. – ISBN 978-0-323-04035-8.		3

### 8.3. Electronic educational resources for teaching academic subjects

#### 8.3.1. Internal Electronic Library System of the University (IELSU)

№	Name of the electronic resource	Brief description (content)	Access conditions	Number of users
	Internal Electronic Library	The works of the staff of	Access by	Not limited

	System (EBS) of PIMU	the ADMU (textbooks, manuals, collections of tasks, manuals, laboratory work, monographs, etc.)	individual login and password from any computer and mobile device	
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### 8.3.2. Electronic educational resources acquired by the University and Open access resources

<http://nbk.pimunn.net/MegaPro/Web>

### 8.3.3 Open access resources

No	Name of the electronic resource	Brief description (content)	Access conditions

## 9. Material and technical support for mastering an academic discipline

### 9.1. List of premises for classroom activities for the discipline.

1. Classrooms with computers
2. Classrooms with microscopes and laboratory equipment
3. Lecture hall

### 9.2. List of equipment for classroom activities for the discipline

1. Laboratory equipment: microscopic equipment (microscopes and magnifiers)
2. Micro-slides and macro-preparations
2. Educational films
3. Computer presentations
4. Mcq tests for each topic of discipline of Biology

### 9.3. A set of licensed and freely distributed software, including domestic production

Item no.	Software	number of licenses	Type of software	Manufacturer	Number in the unified register of Russian software	Contract No. and date
1	Wtware	100	Thin Client Operating System	Kovalev Andrey Alexandrovich	1960	2471/05-18 from 28.05.2018
2	MyOffice is Standard. A corporate user license for educational organizations, with no expiration date, with the right to receive updates for 1 year.	220	Office Application	LLC "NEW CLOUD TECHNOLOGIES"	283	without limitation, with the right to receive updates for 1 year.
3	LibreOffice		Office Application	The Document Foundation	Freely distributed software	
4	Windows 10 Education	700	Operating systems	Microsoft	Azure Dev Tools for Teaching Subscription	



5	Yandex. Browser		Browser	«Yandex»	3722	
6	Subscription to MS Office Pro for 170 PCs for FGBOU VO "PIMU" of the Ministry of Health of Russia	170	Office Application	Microsoft		23618/HN100 30 LLC "Softline Trade" from 04.12.2020

### 10. List of changes to the working program (to be filled out by the template)

Federal State Budgetary Educational Institution of Higher Education  
"Privolzhsky Research Medical University"  
Ministry of Health of the Russian Federation  
(FSBEI HE "PRMU" of the Ministry of Health of Russia)

Department of  
*Name of the department*

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#### CHANGE REGISTRATION SHEET

working program for the academic discipline  
***NAME OF THE ACADEMIC DISCIPLINE***

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Field of study / specialty / scientific specialty: \_\_\_\_\_ (code, name)

Training profile: \_\_\_\_\_  
(name) - for master's degree programs

Mode of study: \_\_\_\_\_  
full-time/mixed attendance mode/extramural

Position	Number and name of the program section	Contents of the changes made	Effective date of the changes	Contributor's signature
1				

Approved at the department meeting  
Protocol No. \_\_\_\_\_ of \_\_\_\_\_ 20\_\_

Head of the Department

\_\_\_\_\_ /  
department name, academic title

\_\_\_\_\_ /  
signature

\_\_\_\_\_ /  
print name