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: **33.05.01 PHARMACY**

Qualification: **PHARMACIST**

Department: **BIOLOGY**

Mode of study: **FULL-TIME**

Labor intensity of the academic discipline: **72 academic hours**

Nizhny Novgorod
2021

The working program has been developed in accordance with the Federal State Educational Standard for the specialty 33.05.01 PHARMACY, approved by Order of the Ministry of Science and Higher Education of the Russian Federation No. 219 of March 27, 2018.

Developers of the working program:

Kalashnikov Ilya Nikolaevich, Head of the Biology Department PRMU, PhD
Moskovtseva Olga Mikhailovna, associate professor of the Department of Biology, PhD.
Knyaseva Elena Sergeevna, associate professor of the Department of Biology, PhD.
Tkachev Konstantin Nikolaevich, assistant of the Department of Biology.

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

Head of the Department, PhD _____ I.N.Kalashnikov
(signature)

August, 26,2021

AGREED

Deputy Head of EMA ph.d. of biology _____ Lovtsova L.V.

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). Universal competences:*

UC-1. Able to realize critical analysis of problem situations based on a systematic approach, develop strategy actions

1.2. Tasks of 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 of Block 1 of GEP HE Б1.О.16

The discipline is taught in 1 semester/ 1 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. botany,
2. microbiology,
3. biological chemistry,
4. pharmacognosy,
5. pharmacology,
6. pathology,
7. philosophy.

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 realize critical analysis of problem situations based on a systematic approach, develop strategy actions	UC-1.1. Analyzes the problem situation as a system identifying its components and connections etween them GPC-1.2. Applies basic physical-chemical and chemical analysis methods for the development, research and examination of medicinal products and medicinal plant raw materials UC-1.3. Critically assesses reliability of information sources, works with conflicting information from different sources GPC-1.4. Applies mathematical methods and performs mathematical processing of data obtained during the	- 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	- use educa-tional, scientific, popular science literature, the Internet for profess-sional activities; - use laboratory equipment, work with a micro-scope; - in the form of generalized schemes to display the processes occurring in the cell; - solve problems in	- methods of information transforma-tion: text, spreadsheet editors, Internet search; - skills of displaying the studied objects in drawings and diagrams; - principles of identi-fication of objects on micro- and macropreparations to substantiate the logical sequence of evolutionary events, stages of embryogenesis, levels of organization of genetic material and

			development of medicines, as well as research and examination of medicines and medicinal plant raw materials	genetic counseling - patterns of heredity and variability in individual development as the basis for understanding the pathogenesis and etiology of hereditary and multi-factorial diseases; - influence on the human body of biotic, abiotic and social factors.	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	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.

					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 parasite-logy	
2.						
3.						

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
	UC-1.	Molecular bases of heredity.	1. Biology is the science of wildlife. Levels of organization of living matter. 2. Replication of hereditary material and its significance. 3. DNA repair.

			4. Protein biosynthesis.
		Classical genetics.	1. Mitosis, meiosis. 2. Patterns of inheritance of traits established by Mendel and Morgan. 3. Genotype as a balanced system of interacting genes (allelic and non-allelic). 4. Forms of variability. Mutagenesis. 5. Fundamentals of medical genetic counseling.
		Ontogenesis and phylogenesis.	1. Периодизация онтогенеза, гаметогенез, тератогенные факторы. 2 .История развития эволюционных идей и современная теория эволюции. 3. Историческое развитие организмов. Антропогенез.
		Fundamentals of medical parasitology.	1. Fundamentals of protozoology. 2. Fundamentals of helminthology. 3. Medical significance of arthropods.

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	1,8	66				
Lectures (L)	0,4	14	14			
Laboratory practicum (LP)*	1,4	52	52			
Practicals (P)	-	-	-			
Seminars (S)	-	-	-			
Student's individual work (SIW)	1,2	42	42			
Mid-term assessment	-	-	-			
credit/exam *(specify the type)*						
TOTAL LABOR INTENSITY	3	108	108			

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	Molecular bases of heredity.	4	9			10	23
1	Classical genetics.	4	20			10	34
1	Ontogenesis and phylogenesis.	2	8			12	22
1	Fundamentals of medical parasitology.	4	15			10	29
	TOTAL	14	52			42	108

* - 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. Introduction to genetics. Mendelism. Morganism.	2	

2	Molecular bases of heredity. DNA replication. Gene expression during protein biosynthesis and its regulation.	2	
3	Genetic engineering, its tasks, methods, prospects for use.	2	
4	Biology of individual development. Ontogenesis. Patterns of embryonic development. Molecular genetic mechanisms of development. teratogenic factors. Cloning is reproductive, therapeutic.	2	
5	Man as an object of genetic research. Methods for studying human heredity. Medical and biological consulting.	2	
6	Fundamentals of medical parasitology. Parasitism as a form of biotic connections. Relationship between parasite and host. Introduction to medical protistology.	2	
7	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 transmissible human diseases.	2	
	TOTAL (total - AH)	14	

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 1	semester 2
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. Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa. Phylums: - Sarcomastigophora, - Apicomplexa, - Ciliophora. Geoprotists, Bioprotists.	5	
2	Kingdom Animalia Phylum Platyhelminthes: - Class Trematoda - Class Cestoda Phylum Nemathelminthes - Class Nematoda	5	
3	Domain Eukaryote. Kingdom Animalia. Phylum Arthropoda. Medical impotance of arthropods.	5	

	Mosquitoes and human disease.		
4	Domain Eukaryote. Kingdom Animalia. Phylum Arthropoda. Medical impotance of arthropods. Arthropods are vectors for human diseases.	5	
5	Molecular basis of heredity. Nucleic acids. DNA replication.	5	
6	Expression of Genetic information: Transcription. Translation.	5	
7	The Cell Cycle. Mitosis and Meiosis. Ontogenesis. Gametogenesis.	5	
8	Mendelian Genetics. Mono- and dihybrid cross. Interaction of genes. Sex Determination. Sex Linkage.	5	
9	Human Genetics. Methods of investigation of Human Heredity.	7	
	TOTAL (total - AH)	52	

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	
		semester	semester
1	work with lecture material, providing for the development of lecture notes and educational literature	5	
2	search (selection) and review of literature and electronic sources of information on an individually given course problem	5	
3	doing homework for class;	5	
4	performance of home control work (problem solving, on-line testing);	5	
5	study of the material submitted for independent study (separate topics);	5	
6	preparation for laboratory work, practical and seminar classes;	5	
7	preparation for control work;	5	
8	preparation for intermediate certification	7	
	TOTAL (total - AH)	42	

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

№		Types of control	Name of		Assessment formats

	Semester No.			section of academic discipline	Competence codes	types	number of test questions	number of test task options
1.	1	Current monitoring	Control of mastering the topic. Monitoring the student's individual work	Molecular bases of heredity.		Online tests	25	Unlimited.
						Control questions.	10	98
2.	1		Control of mastering the topic. Monitoring the student's individual work	Classical genetics.		Online tests	25	Unlimited.
						Control questions.	10	140
3.	1		Control of mastering the topic. Monitoring the student's individual work	Ontogenesis and phylogenesis.		Online tests	30	Unlimited.
						Control questions.	10	140
4.	1		Control of mastering the topic. Monitoring the student's individual work	Fundamentals of medical parasitology.		Online tests	30	Unlimited.
						Control questions.	10	160
5.	1	Mid-term assessment	Exam/ Credit	All sections		Online tests	4	400
						Control questions.	2	100

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
1	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
2	Shcherbatyuk, T. G. General biology. Introduction to	Online resource.	

	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: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=197051&idb=0	

8.2. Further reading

№	Name according to bibliographic requirements	Number of copies	
		at the department	in the library
1	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 of NNSMA, 2012.		127
2	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: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=166339&idb=0	Online resource.	
3	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
4	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: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=166361&idb=0	Online resource.	
5	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
6	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: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=165742&idb=0	Online resource.	
7	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
8	Markell and voge's medical parasitology / E. K.		15

	Markell, D. T. John, W. Krotoski. – 8th ed. – W.B. Saunders Company, 1999. – 501 с. : ил. – ISBN 0-7216-7634-0.		
9	Color atlas of genetics / E. Passarge. – 3rd ed. – Stuttgart : Thieme, 2007. – 486 с. : ил. мяг. – ISBN 978-3-13-100363-8.		11
10	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
11	Task book on the course of basic and medical genetics : educational and methodological manual / O. B. Воронкова, И. А. Осихов, А. Г. Семенов [et al.]. – Томск : Издательство СибГМУ, 2022. – 172 с. – URL: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=225385&idb=0	Online resource.	
12	General biology. Molecular genetics : Handbook for international students / E. S. Knyazeva, O. M. Moskovtseva, I. N. Kalashnikov, T. G. Scherbatyuk. – Н. Новгород : Изд-во ПИМУ, 2021. – 1 файл (12184 Кб). – ISBN 978-5-7032-1421-3. – URL: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=217691&idb=0	Online resource.	
13	Basics of clinical genetics : a training manual for students / O. V. Khaletskaya, E. V. Tush, A. N. Kolchina ; FSBEI HE «PRMU» MOH Russia. – N. Novgorod : Publishing House of Privolzhskiy Research Medical University, 2021. – ISBN 978-5-7032-1406-0. – URL: http://nbk.pimunn.net/MegaPro/UserEntry?Action=Link_FindDoc&id=218143&idb=0	Online resource.	

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 System (EBS) of PIMU	The works of the staff of the ADMU (textbooks, manuals, collections of tasks, manuals, laboratory work, monographs, etc.)	Access by individual login and password from any computer and mobile device	Not limited

8.3.2. Electronic educational resources acquired by the University and Open access resources

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

9. Material and technical support for mastering an academic discipline

9.1. List of premises for classroom activities for the discipline

1. Training rooms equipped with computers with Internet access, cabinets for storing microscopic equipment, cabinets for storing micro- and macropreparations, study tables, laboratory equipment and technology.

2. Lecture hall.

9.2. List of equipment for classroom activities for the discipline

1. Laboratory equipment: microscopic equipment (microscopes and magnifiers)

2. Technical equipment: multimedia systems (PC or laptop, projector, screen, presenters), interactive whiteboard.

Sets of slides, tables, diagrams, multimedia visual materials on various sections of the discipline. Micro- and macropreparations, dummies. Situational tasks, test tasks on the topics studied,

- *computer presentations on all topics of the lecture and practical courses,*
- *educational videos on the sections: molecular biology, developmental biology, medical parasitology, ecology and biosphere, evolution, anthropogenesis.*

3. Information stands on sections of the Biology course.

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/HN10030 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

CHANGE REGISTRATION SHEET

working program for the academic discipline
NAME OF THE ACADEMIC DISCIPLINE

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