

Summary of the working program of the academic discipline

«BIOLOGY»

General Educational Program of higher education (specialist's degree programs)

31.05.01 GENERAL MEDICINE

Department: **BIOLOGY**

1. The purpose of mastering the discipline (*participation in the formation of relevant competencies – specify the codes*):

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

2. Position of the academic discipline in the structure of the General Educational Program (GEP).

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.

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

Mastering the discipline aims at acquiring the following universal (UC) 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	- 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	- 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	- 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

			<p>complex scientific problems related to the professional field; search for information and solutions based on actions, experiment and experience</p> <p>IUK 1.3 Has practical experience: research of the problem of professional activity with the use of analysis, synthesis and other methods of intellectual activity; development of an action strategy for solving professional problems</p>	<p>human genetics; principles of medical genetic counseling;</p> <ul style="list-style-type: none"> - 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>depict chromosomes; using these notations, solve problems for mitosis, meiosis, gametogenesis;</p> <ul style="list-style-type: none"> - 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. 	<p>genetic material and processes of realization of genetic information, stages of development of parasites.</p> <ul style="list-style-type: none"> - 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.
2.	GPC-10	Able to understand the principles	IOPK 10.1 Knows: the capabilities of reference	- general patterns of origin and development	- use educational, scientific, popular science literature, the Internet for	- methods of information transformation: text, spreadsheet

		<p>of modern information technologies and use them to solve the tasks of professional activity</p>	<p>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 reference systems and professional databases; use modern medical and biological terminology; master and</p>	<p>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.</p>	<p>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</p>	<p>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 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>apply modern information and communication technologies in professional activity, taking into account the basic requirements of information security</p> <p>IOPK 10.3</p> <p>Has practical experience in the use of modern information and bibliographic resources, the use of special software and automated information systems.</p>		<p>course of development, leading to the formation of variants, anomalies and defects;</p> <ul style="list-style-type: none"> - to identify human parasites on micro- and macropreparations; - solve situational problems in parasitology. 	
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4. Volume of the academic discipline and types of academic work

Total labor intensity of the discipline is 6 CU (216 AH)

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
TOTAL LABOR INTENSITY	6	216	90	126

5. Sections of the academic discipline and competencies that are formed

№	Competence code	Section name of the discipline	The content of the section in teaching units
1		Cell Biology	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.
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>1. Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa. 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>2. Kingdom Animalia. Phylum Platyhelminthes. Class Trematoda. 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> Class Cestoda. Main features of Cestodes. Cestodes: <i>Diphyllobothrium latum</i>, <i>Taenia saginata</i>, <i>Taenia solium</i>, <i>Hymenolepis nana</i>, <i>Echinococcus granulosus and multilocularis</i>. Phylum Nemathelminthes Class Nematoda. 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>3. Kingdom Animalia. Phylum Arthropoda. Medical impotence of arthropods. Characteristics of phylum Arthropoda. Vector-borne diseases and non vector-borne diseases. Medical importance of Arthropods. Poisonous Chelicerate. Medical importance of mosquitoes.</p>

			<p>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>.</p> <p>Life cycles with complete and incomplete metamorphosis. Stages of life cycles of lice, fleas, cockroaches, fly.</p> <p>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. DNA Replication and Recombination. Mechanism of prokaryotic and eukaryotic DNA-replication. The Meselson-Stahl experiments.</p> <p>Mutations. Types of gene mutations.</p> <p>Storage and Expression of Genetic Information. Central dogma. Genetic code. Properties of the genetic code.</p> <p>Mechanism of protein synthesis in prokaryotes and eukaryotes. 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. 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.</p> <p>Different types of reproduction. The five phases of the cell cycle. Interphase. Mitosis. Structure and function of hereditary material during the cell cycle.</p> <p>Peculiarities of the human cell cycle. Meiosis and Sexual Reproduction. Spermatogenesis and Oogenesis. Stages of gametogenesis. Meiosis. Phases of meiosis. The</p>

			Significance of Meiosis. Genetic regulation of the cell cycle.
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