Summary of the working program of the academic discipline

«BIOLOGY»

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

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-8. Able to use basic physico-chemical, mathematical and natural science concepts and methods in solving professional problems

GPC-13. Able to solve standard tasks of professional activity using information, bibliographic resources, medical and biological terminology, information and communication technologies, taking into account the basic requirements of information security

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,	- 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;	- 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,	- 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 macropreparatio ns to substantiate the logical sequence of evolutionary

| | | | 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 of analysis, synthesis and other methods of intellectual activity; development of an action strategy for solving professional problems | 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. | 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. | 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.	GPC-8	Able to use basic physico-chemical, mathematical and natural science concepts and methods in solving professional problems	IOPK 8.1 Knows: basic physico-chemical, mathematical and natural science concepts and methods that are used in medicine IOPK 8.2 is able to: interpret the data of the basic physico-chemical, mathematical and natural-scientific research methods in solving professional problems IOPK 8.3 Has practical experience in the application of basic physico-chemical, mathematical and natural science research methods in solving professional problems	- 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.	- 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	- 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.

				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.		
3.	GPC-13	Able to solve standard tasks of professional activity using information, bibliographic resources, medical and biological terminology, information and communication technologies, taking into account the basic requirements of information security	IOPK 13.1 Knows: the possibilities 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 13.2 is able to: apply modern information and communicati	- 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	- 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	- 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.

			on 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 apply modern information and communication technologies in professional activity, taking into account the basic requirements of information security IOPK 13.3 Has practical experience in the use of modern information and bibliographic resources, the use of special	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.	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.	- 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.

			software and automated information systems to solve standard tasks of professional activity, taking into account the basic requirements of information security			

4. Volume of the academic discipline and types of academic work
Total labor intensity of the discipline is <u>5</u> CU (<u>180</u> 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	***2,4***	***86***		
Lectures (L)	0,5	18	12	6
Laboratory practicum (LP)*				
Practicals (P)	1,9	68	32	36
Seminars (S)	-	-	-	-
Student's individual work (SIW)	**1,6**	**58**	28	30
Mid-term assessment	-	-	-	-
credit/exam *(specify the type)*	**0,6**	**36**	-	36
TOTAL LABOR INTENSITY	**5**	**180**	**72**	**108**

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	UC-1 GPC-8 GPC-13	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		Fundamentals of medical parasitology	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. 1. **Domain Eukaryote. Kingdom Protista. Subkingdom Protozoa.** Main features of kingdom Protista. Main features of phyla and subphyla from the kingdom. Geoprotists: *Entamoeba histolytica, Lamblia intestinalis, Balantidium coli, Trichomonas vaginalis* Bioprotists: *Leshmania tropica , Trypanosoma brucei, Toxoplasma gondii, Plazmodium species.* 2. **Kingdom Animalia.** **Phylum Platyhelminthes.** **Class Trematoda.** Main features of Trematodes. Trematodes: *Fasciola hepatica, Opistorchis felineus, Paragonimus westermani, Schistosoma sp.* **Class Cestoda**. Main features of Cestodes. Cestodes: *Diphyllobothrium latum, Taenia saginata, Taenia solium, Hymenolepis nana, Echinococcus granulosus* **Phylum Nemathelminthes** **Class Nematoda.** Main features of Nematodes. Nematodes: *Ascaris lumbricoides, Enterobius vermicularis, Trichinella spiralis, Dracunculus medinensis, Wuchereria bancrofti, Loa Loa* 3. **Kingdom Animalia.** **Phylum Arthropoda.** Medical impotance 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 *Ixodes persulcatus,Ornithodorus papillipes, Sarcoptes scabiei, Demodex folliculorum.* 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). *Pediculus humanus, Phtirus pubis, Xenopsylla cheopis, Wohlfahrtia magnifica, Blatta orientalis, Anopheles and Culex mosquitoes.*
3		Molecular bases of heredity	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. Mutations. Types of gene mutations. Storage and Expression of Genetic Information. Central dogma. Genetic code. Properties of the genetic code.

			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. Translation. Proteins: The End Product of Genetic Expression. Activating enzymes. Differences between bacterial and Eukaryotic protein synthesis. Regulation of gene expression in prokaryotes and eukaryotes. Lactose operon, regulation of different steps of eukaryotic gene expression.
4		Classical genetics Mendelian Genetics. Morgan's theory. Chromosome theory.	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. Mutations. Types of chromosomal and genome mutations. Diseases which are results of chromosomal and genome mutations. Methods of human genome investigations.
5		Ontogenesis and phylogenesis	Cell Division. Morphology and chemical composition of chromosomes. Chromosome number. Haploidy and diploidy. Different types of reproduction. The five phases of the cell cycle. 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.