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**MINISTRY OF EDUCATION AND SCIENCE OF RUSSIA**

**Federal State Budgetary Educational Institution  
of higher education**


**«I.N. Ulianov Chuvash State University»  
(FSBEI of HE «I.N. Ulianov Chuvash State University»)**

Medical Faculty

Department of General and Clinical Morphology and Forensic Medicine

«APPROVE»

Vice-rector for Academic Affairs

  
I.E. Poverinov

« 13 » 04 2022

**Working programs of the discipline (module)  
«Гистология, эмбриология, цитология / Histology, Embryology,  
Cytology»**

Direction of training / specialty 31.05.03 Стоматология / Dentistry  
Graduate's qualification Врач-стоматолог / Dental Practitioner

Direction (profile) / specialization «Dentistry»

Form of training – очная / intramural

Course – 1, 2

Term – 2, 3

Total academic hours/credit points – 252/7

The year of beginning the training – 2022

The fundamental document for compiling the working program of the discipline (module)  
Федеральный государственный образовательный стандарт высшего образования -  
специалитет по специальности 31.05.03 Стоматология (приказ Минобрнауки России от  
12.08.2020 г. № 984)

Approved by:

Head of the department, Doctor of Biological Sciences N.N. Golubtsova

The working program was approved at the meeting of the Department of General and  
Clinical Morphology and Forensic Medicine,

25.03.2022, protocol № 7

Head of the department N.N. Golubtsova

Approved by

Dean of the Medical Faculty V.N. Diomidova

Acting Head of the Educational and Methodological Department E.A. Shirmanova

## **1. The purpose and objectives of training in the discipline (module)**

The purpose of the discipline - He/ she will receive modern knowledge about the development, structure, functioning of cells and tissues of the human body - in the sections of general histology, cytology and embryology, and the organ level of organization of these components - in the section of private histology. Study of morphological research methods and microscopic techniques.

The objectives of the discipline - 1. Acquaintance with histological equipment, methods for studying tissues, methods for detecting individual structures and substances of a cell.

2. Study of structural features of cells of different tissues, features of cell secretion, electron microscopic structure of organelles in normal cells of different tissues.

3. The study of different types of tissues: epithelial, muscle, nervous, connective with a detailed study of age-related morphology and histophysiology.

4. The study of the structure of germ cells, the stages of their reproduction, the processes of fertilization, crushing, gastrulation, laying of axial and provisional organs.

5. The study of the histological structure of organ systems at various stages of ontogenesis, and deviations in pathological development.

6. Study of the histological structure and features of the morphogenesis of the organs of the maxillofacial region and the dentition.

## **2. The place of practical training in the structure of the educational program of higher education**

The discipline «Гистология, эмбриология, цитология / Histology, Embryology, Cytology» относится к обязательной части учебного плана refers to the mandatory part in the curriculum of the educational program of higher education (hereinafter referred to as the EP of HE) in the field of training / specialty 31.05.03 Стоматология, direction (profile) / specialization of the program «Dentistry».

Previous academic disciplines (modules) and (or) practices that form the knowledge, skills and abilities necessary for training in the discipline (module):

Анатомия / Anatomy

Иммунология / Immunology

Микробиология, вирусология / Microbiology, Virology

Нормальная физиология / Normal Physiology

Безопасность жизнедеятельности / Health and Safety

Биология / Biology

Knowledge, skills and abilities formed as a result of training in a discipline (module) are necessary when teaching in the following disciplines (modules) and (or) practices:

Патофизиология / Pathophysiology  
 Патологическая анатомия / Pathological Anatomy  
 Материаловедение в ортопедической практике / Materials Science in Orthopedic Practice  
 Основы материаловедения в стоматологии / Fundamentals of Materials Science in Dentistry  
 Топографическая анатомия и оперативная хирургия головы и шеи / Topographic Anatomy and Operative Surgery of the Head and Neck  
 Судебная медицина / Forensic Medicine

### 3. Planned learning outcomes in the discipline (module), correlated with the planned learning outcomes

Planned learning outcomes in the discipline (module), correlated with the planned learning outcomes

Code and name of the competence	Code and name of the competence achievement	Descriptors for the indicator of competence achievement (learning)
ОПК-9 Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач / He/she is able to evaluate morphofunctional, physiological states and pathological processes in the human body to solve professional problems	ОПК-9.1 Способен распознавать морфофункциональные, физиологические состояния и патологические процессы в организме человека / He/she is able to recognize morphofunctional, physiological states and pathological processes in the human body	<p>Знать особенности эмбрионального развития зубочелюстного аппарата, органов и систем органов человека, их микроскопического строения на клеточном и тканевом уровнях организации, с учетом возрастной гистофизиологии; / He/she knows the features of the embryonic development of the dentition, organs and systems of human organs, their microscopic structure at the cellular and tissue levels of organization, taking into account age-related histophysiology;</p> <p>Уметь распознавать на микроскопическом уровне клеточные, тканевые и органые структуры на основе знаний о морфо-функциональной организации здорового организма человека / He/she is able to recognize at the microscopic level cellular, tissue and organ structures based on knowledge of the morpho-functional organization of a healthy human body</p> <p>Владеть методами идентификации клеточных, тканевых и органных структур на основе знаний о морфо-</p>

		<p>функциональной организации здорового организма человека/  He/she owns methods for identifying cellular, tissue and organ structures based on knowledge of the morpho- functional organization of a healthy human body</p>
<p>ОПК-9 Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач / He/she is able to evaluate morphofunctional, physiological states and pathological processes in the human body to solve professional problems</p>	<p>ОПК-9.2 Способен анализировать морфофункциональные, физиологические состояния и патологические процессы в организме человека / He/she is able to analyze morphofunctional, physiological states and pathological processes in the human body</p>	<p>Знать особенности морфо-функциональной организации клеток, тканей и органов человека в эмбриональный и постэмбриональный периоды онтогенеза/  He/she knows the features of the morpho-functional organization of human cells, tissues and organs in the embryonic and post-embryonic periods of ontogenesis  Уметь анализировать особенности морфо-функциональной организации клеток, тканей и органов человека в эмбриональный и постэмбриональный периоды онтогенеза/  He/she is able to analyze the features of the morpho-functional organization of human cells, tissues and organs in the embryonic and post-embryonic periods of ontogenesis  Владеть методами анализа морфо-функциональной организации клеток, тканей и органов человека в эмбриональный и постэмбриональный периоды онтогенеза</p>
<p>ОПК-9 Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач / He/she is able to evaluate morphofunctional, physiological states and pathological processes in</p>	<p>ОПК-9.3 Способен диагностировать морфофункциональные, физиологические состояния и патологические процессы организма человека / He/she is able to diagnose morphofunctional, physiological states and pathological processes in the human body</p>	<p>Знать виды гистологической техники и современные гистологические методы для оценки морфо-функционального состояния клеток, тканей и органов человека в норме и при патологических отклонениях/  He/she knows the types of histological techniques and modern histological methods for assessing the morpho-functional state of human cells, tissues and</p>

the human body to solve professional problems		organs in normal and pathological abnormalities Уметь применять современное гистологическое оборудование и методы морфологической диагностики для оценки морфо-функционального состояния организма человека/ He/she is able to apply modern histological equipment and methods of morphological diagnostics to assess the morpho- functional state of the human body Владеть гистологическим оборудованием, техникой приготовления цитологического и гистологического препарата с диагностической целью/ He/she owns histological equipment, techniques for preparing cytological and histological preparations for diagnostic purposes
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#### 4. Structure, scope and content of the discipline (module)

Educational activities in the discipline (module) are carried out:

- in the form of students' face-to-face work with the teaching staff of the organization and (or) persons involved by the organization to implement the educational programs on other terms (hereinafter - contact work);

- in the form of students' independent work.

Face-to-face work can be classroom-based, extramural, as well as it can be conducted in an electronic information and educational environment (EIEE).

Learning sessions in the discipline (module) and interim assessment of students are conducted in the form of face-to-face work and in the form of students' independent work.

During learning sessions in the discipline (module) face-to-face work includes: lecture-type classes, seminar-type classes and (or) group consultations, and (or) individual work of students with the teaching staff of the organization and (or) persons involved by the organization to implement the educational programs on other terms (including individual consultations).

Legend:

Lec – lectures, Lab – laboratory work, Pr – practical classes, ICW – individual face-to-face work, IW – independent work.

#### 4.1. Content of the discipline (module)

Section name	The section's content	Formed competences	Competence achievement indicator
Section 1. Microscopic technique. Cytology. Embryonic development	Obtaining skills in staining preparations and working with a microscope.	ОПК-9	ОПК-9.1, ОПК-9.2, ОПК-9.3

of man.	Cytology.		
Section 1. Microscopic technique. Cytology. Embryonic development of man.	Cytology. Cell structure. The structure of the nucleus and organelles.	ОПК-9	ОПК-9.1, ОПК-9.2, ОПК-9.3
	Human embryology (fertilization, formation of blastula, gastrula, laying of provisional organs)		
Section 2. General histology	Epithelial tissue		
	Connective tissue. Blood. Types of cells, their structure and functions. Calculation of the leukocyte formula.		
	Connective tissue. Hematopoiesis.		
	Connective tissue. Loose and dense connective tissue.		
	Skeletal tissues. Bone development.		
	Muscle tissue.		
	Nerve tissue. Classification of cells. Structure and functions.		
	Nerve tissue. Nerve endings.		
Section 3. Private histology	Nervous system. Spinal cord. Spinal nodes.		
	Nervous system. The cerebral cortex and the cerebellar cortex.		
	Sense organs. The organ of sight and smell.		
	Sense organs. The organ of hearing, balance and taste.		
	The cardiovascular system.		
	Hematopoietic organs. The structure of the thymus and lymph node.		
	Hematopoietic organs. The structure of the spleen and tonsils.		
	Digestive system. Study of the esophagus and stomach.		
Section 3. Private	Digestive system. Study of		ОПК-9.1, ОПК-

histology	the small and large intestines.		9.2, ОПК-9.3
Section 3. Private histology	Digestive system. The study of the structures of the liver, pancreas.	ОПК-9	ОПК-9.1, ОПК-9.2, ОПК-9.3
	Endocrine organs. The structure of the epiphysis, thyroid and parathyroid glands.		
	Endocrine Organs. The structure of the pituitary, hypothalamus, adrenal glands.		
	Respiratory system. Study of pathways and lungs. Features of development. Their structure, distinctive features.		
	Skin. Study of the structure of its layers. Development, change.		
	The excretory system. Kidneys and excretory tracts. Structure, features of development, functions.		
	Male reproductive system. Features of development.		
	Female reproductive system. Features of development. Menstrual cycle.		
	Female reproductive system. Breast. Placenta. The mother-fetus relationship.		
	Section 4. Histological structure and morphogenesis of the organs of the oral cavity		
Tooth development. The structure of the tissues of the tooth.			
Face development. Gill apparatus.			
Final examination work	Test		
	Final exam		

#### 4.2. Scope of the discipline and types of academic work

Forms of control and types of academic work		Labor intensity of the discipline (module)		
		2	3	total
1. Face-to-face work:		64,2	64,3	128,5
In-class learning in total, including:		64	64	128
Лекционные занятия (Лек)		16	16	32,5
Лабораторные занятия (Лаб)		48	48	96
Индивидуальная контактная работа (ИКР)		0,2	0,3	
2. Independent work of the student:		43,8	25,7	69,5
3. Intermediate certification (exam) (зачет, экзамен)		За	Эк	За, Эк
Total:	academic hours	108	144	252
	credit units	3	4	7

№ item	The section's (theme's) name	Face-to face work, including in the electronic information and educational environment, academic hours				IW, academic hours	Total, academic hours
		Lect.	Pr.	Lab.	ICW		
	Section 1. Microscopic technique. Cytology. Embryonic development of man.						
1	Obtaining skills in staining preparations and working with a microscope. Cytology.			3		2	5
2	Cytology. Cell structure. The structure of the nucleus and organelles.			3		2	5
3	Human embryology (fertilization, formation of blastula, gastrula, laying of provisional organs)	2		3		2	7
	Section 2. General histology						
4	Epithelial tissue	2		3		2	7

5	Connective tissue. Blood. Types of cells, their structure and functions. Calculation of the leukocyte formula.	2		3		2	7
6	Connective tissue. Hematopoiesis.			3		2	5
7	Connective tissue. Loose and dense connective tissue.	2		3		3,8	8,8
8	Skeletal tissues. Bone development.	2		9			11
9	Muscle tissue.			3		8	11
10	Nerve tissue. Classification of cells. Structure and functions.	2		3		6	11
11	Nerve tissue. Nerve endings.	2				6	8
	Section 3. Private histology						
12	Nervous system. Spinal cord. Spinal nodes.			3		2	5
13	Nervous system. The cerebral cortex and the cerebellar cortex.			3		2	5
14	Sense organs. The organ of sight and smell.			2		4	6
15	Sense organs. The organ of hearing, balance and taste.			2			2
16	The cardiovascular system.	2		2			4
17	Hematopoietic organs. The structure of the thymus and lymph node.			3		2	5
18	Hematopoietic organs. The structure of the spleen and tonsils.	2		3		2	7
19	Digestive system. Study of the esophagus and stomach.	2		3		2	7
20	Digestive system. Study of the small and large intestines.			3		2	5
21	Digestive system. The study of the structures of the liver, pancreas.	2		3		2	7
22	Endocrine organs. The structure of the epiphysis, thyroid and parathyroid glands.			3		2	5
23	Endocrine Organs. The structure of the pituitary, hypothalamus, adrenal glands.	2		3		2	7
24	Respiratory system. Study of pathways and lungs. Features of development. Their structure, distinctive features.			3		1	4

25	Skin. Study of the structure of its layers. Development, change.			3		1	4
26	The excretory system. Kidneys and excretory tracts. Structure, features of development, functions.	2		3		1	6
27	Male reproductive system. Features of development.			3		1	4
28	Female reproductive system. Features of development. Menstrual cycle.	2		3		1	6
29	Female reproductive system. Breast. Placenta. The mother-fetus relationship.			3		2	5
	Section 4. Histological structure and morphogenesis of the organs of the oral cavity						
30	The structure of the oral mucosa, the structure of the tongue and major salivary glands.	2		3		1,7	6,7
31	Tooth development. The structure of the tissues of the tooth.	2		3		2	7
32	Face development. Gill apparatus.			3		1	4
	Final examination work						
33	Test	0,2					0,2
34	Final exam	0,3					0,3
Total academic hours		32,5		96		69,5	252

#### 4.3. Summary of the discipline (module), structured by sections (topics)

##### Раздел 1. Section 1. Microscopic technique. Cytology. Embryonic development of man.

##### Тема 1. Obtaining skills in staining preparations and working with a microscope. Cytology.

Лабораторное занятие. Definition of the subject. Introduction to histology. Technique for the manufacture of histological specimens.

General characteristics of the discipline the main sections of the course of histology. Goals and objectives, objects and methods of research. Types of microscopy. History of the development of histology. Technique for the manufacture of histological specimens. Collection of test material. fixation methods. Coloring. Types of dyes.

Histological instruments of the department. Technique for the manufacture of histological specimens.

Acquaintance with the histological instruments of the department. The study of the technique of manufacturing histological preparations. Repetition of the rules for working with a microscope.

Cytology: cytoplasm and its components. cytomembrane, inclusions, membranous organelles,

Modern positions of the cellular theory. Cytology, definition of the concept. Cell definition. Non-cellular structures of the living. The structure and functional significance of the cytomembrane. Structural components of the cytoplasm of an animal cell: membrane organelles, their structure, classification and functions: endoplasmic reticulum, Golgi complex, mitochondria, lysosomes, peroxisomes. Intracellular transport and sorting of molecules. Structural components of the cytoplasm of an animal cell: non-membrane organelles: microfilaments, myrotubules, cilia, flagella, microvilli, cell center and centrioles, ribosomes. Intercellular contacts, their classification, structure, functional significance in normal and pathological conditions. Cell and non-cellular structures.

### **Тема 2. Cytology. Cell structure. The structure of the nucleus and organelles.**

Лабораторное занятие. Cytology: Nucleus. Mitosis.

The shape of the nuclei. Structural components of the nucleus in the interphase according to the data of light and electron microscopy. Types of chromatin. Nucleolus, structure, functions. Kernel functions. Nuclear pores, their structure and significance. Transport of substances to and from the nucleus. The cell cycle, its periods, regulation of the passage of cells through the cell cycle. methods of cell reproduction. Modern ideas about the process of mitosis. its phases, stages. Meiosis. Amitosis. Endomitosis. Cell response to external influences. Apoptosis - definition, stages, regulation, functional significance.

### **Тема 3. Human embryology (fertilization, formation of blastula, gastrula, laying of provisional organs)**

Лекционное занятие. General human embryology: Gametes, fertilization, cleavage, gastrulation.

The concept of progenesis. Gametogenesis. Structure and classification of eggs. The structure of the sperm. Fertilization: methods and phases. periods of embryogenesis. Cleavage of the zygote and its types. Features of progenesis and fertilization in humans. Formation and structure of the blastocyst. Implantation of the blastocyst in the endometrium and its phases. Gastrulation: the essence of the process, stages, methods.

Лабораторное занятие. Revealing knowledge on the topic "Meiosis. Gametogenesis. Fertilization. Splitting up. Gastrulation. The study of preparations of germ cells and zygotes.

The laying of germ layers and axial organs. Trunk fold and formation of provisional organs in the chicken embryo.

## **Раздел 2. Section 2. General histology**

### **Тема 4. Epithelial tissue**

Лекционное занятие. Tissues. Epithelial tissue.

Definition of the concept of tissue. Structural components of tissues. The concept of cell population and cell differon. The structure of the intercellular substance. Stages. tissue development during embryogenesis. Classification of tissues. Tissue regeneration. General characteristics and functions of epithelial tissues. Structural and functional features of stratified epithelium. Morphological, genetic and topographic classification of epithelial tissues. glandular epithelium. Classification of glands. Endocytosis. Phases of the secretory cycle of glandular cells.

Лабораторное занятие. Single layer epithelial tissues. Identification of knowledge on the topic. Study using posters, micrographs and preparations of the structure of different types of single-layer epithelium. Multilayered epithelial tissues. Identification of knowledge on the topic. Study using posters, micrographs and preparations of the structure of different types of stratified epithelium and types of exocrine glands.

### **Тема 5. Connective tissue. Blood. Types of cells, their structure and functions.**

### **Calculation of the leukocyte formula.**

Лекционное занятие. Connective tissues. Blood.

Classification of connective tissues. Origin, structure and functions of blood. Blood plasma, chemical composition, functions. Types of shaped elements, their structural and functional characteristics. Classification, structure and functions of erythrocytes, platelets. Classification, structure and functions of leukocytes (basophils, eosinophils, neutrophils, lymphocytes, monocytes). The concept of hemogram. Leukocyte formula. Age features of blood. Lymph, structural components, types and functions of lymph.

Лабораторное занятие. Connective tissue: blood, reticular tissue.

Revealing knowledge about the composition of blood, structure, classification and functional significance of shaped elements, about the structure of reticular tissue. The concept of hemogram and leukocyte formula. Drawing up a leukocyte formula based on blood smear preparations.

### **Тема 6. Connective tissue. Hematopoiesis.**

Лабораторное занятие. Hematopoiesis.

Revealing knowledge about hematopoiesis. Analysis of the processes of erythropoiesis, lymphocytopoiesis, thrombopoiesis, monocytopenia. Identification and sketching of cells of the erythrocyte, granulocytic and platelet rows.

### **Тема 7. Connective tissue. Loose and dense connective tissue.**

Лекционное занятие. Proper connective tissues. Features of development and structure.

Loose fibrous irregular connective tissue. Features of the structure and function. Characterization of cell types of connective tissues (structural and functional): fibroblasts, mast cells, adventitial cells, pericytes, fat cells, pigment cells. Components of the intercellular substance. Dense fibrous connective tissue (formed and unformed). Tendon structure. Connective tissue with special properties. Features of the structure and function. White and brown adipose tissue. Reticular tissue, significance for the morphofunctional organization of hematopoietic and immune organs. Pigment fabric. Gelatinous (mucous) connective tissue. Cellular types of loose connective tissue: macrophages, plasma cells. The concept of the macrophage system. The role of macrophages in immunity. Presentation of antigens. The concept of immunity, antigens, antibodies. Types of immunity. Interaction of cells of loose connective tissue during the development of the immune response.

Лабораторное занятие. Loose connective tissue.

Revealing knowledge about the cellular and non-cellular composition of the studied connective tissue, about the functional significance of connective tissue cells, about the structure of non-cellular structures. The concept of the macrophage system. Interaction of cells of loose connective tissue during the development of the immune response. Dense connective tissue, special types of connective tissue. Revealing knowledge about the cellular and non-cellular composition of the studied types of connective tissue, about the functional significance of connective tissue cells, about the structure of non-cellular structures. To study the structure of the tendon on micropreparations

### **Тема 8. Skeletal tissues. Bone development.**

Лекционное занятие. Skeletal connective tissues.

Formation, types and functions of cartilaginous tissues. Types, structure, localization. Differences between chondrocytes and chondroblasts. Formation of isogenic groups. Perichondrium, structure and functions. Types of cartilage growth. Bone tissues. Features of the intercellular substance. Classification of bone tissues. The structure of the diaphysis of a tubular bone. Bone development.

Osteohistogenesis, methods and stages. Direct and indirect osteogenesis. Bone regeneration. Factors affecting the process of osteohistogenesis and the state of bone tissue.

Лабораторное занятие. The structure of cartilage, its types, the structure of the lamellar bone. Revealing knowledge about the types and structure of cartilage and bone tissue, about chondro- and osteogenesis. The study of preparations of cartilage and bone tissue. Bone development.

Revealing knowledge about the sources and methods of bone tissue development. Study of bone development preparations.

Лабораторное занятие. The structure of cartilage, its types, the structure of the lamellar bone.

### **Тема 9. Muscle tissue.**

Лабораторное занятие. Muscle tissue.

Revealing knowledge about the sources and methods of development of muscle tissue, about the structural and functional units of smooth and striated muscle tissue, about the structure of the sarcomere, the structure of the intercalated discs. The study of preparations of smooth muscle tissue, striated skeletal and striated cardiac muscle tissue.

### **Тема 10. Nerve tissue. Classification of cells. Structure and functions.**

Лекционное занятие. Nerve tissue.

Sources and stages of development of nervous tissue. Cell composition. Classification of neurocytes by morphology and function. Classification and functional significance of various gliocytes. The structure of nerve cells. axonal transport. Regeneration of nervous tissue. Nerve endings, nerve fibers. Nerve fiber, definition of the concept, functions, types. Nerve endings. Classification. motor nerve endings. Receptors. Definition, classification by localization and area of perception, by specificity of perception, by morphology. Interneuronal synapses and their classification according to localization, according to the method of transmission of a nerve impulse and according to the nature of the mediator. Electron-microscopic structure of the chemical synapse, synaptic transmission.

Лабораторное занятие. Nerve tissue.

Revealing knowledge about the sources and methods of development of the nervous tissue, about the structure and classification of neurons, about the structure of the nerve fibers of the pulpy and non-pulmonic. Nervous endings. Revealing knowledge about the classification of nerve endings, about the structure of receptors and effectors. Analysis of the structure and functioning of the reflex arc, synapses, nerve endings.

### **Тема 11. Nerve tissue. Nerve endings.**

Лекционное занятие. Spinal cord. Spinal and autonomic ganglia.

## **Раздел 3. Section 3. Private histology**

### **Тема 12. Nervous system. Spinal cord. Spinal nodes.**

Лабораторное занятие. Spinal cord. Spinal and autonomic ganglia.

Tissue composition and development of the organs of the nervous system. Somatic and autonomic parts of the nervous system. Organs of the peripheral nervous system, their functional significance, age-related changes. The structure and significance of nerve trunks, membranes. Development, structure and localization of the spinal ganglia. Cell composition.

Functional significance of pseudo-unipolar neurons. Terminal sections of peripheral processes and the fate of the central processes of these cells. Sheaths of the brain and spinal cord. Organs of the central nervous system, their functional significance. Development, structure, age-related features of the morphology of the spinal cord. Types of neurons in the gray matter of the spinal cord. The concept of nerve centers of the nuclear type. Nuclei of the gray matter of the spinal cord, their localization and functional significance. Pathways of the spinal cord. The brain stem - its structural components and projection pathways. Cerebellum: development, structure, functional significance, age-related features of the structure. Localization of gray and white matter. The relief of the cerebellar cortex and its layered structure. The concept of nerve centers of the screen type. Afferent and effector structures of the cerebellar cortex, features of the structure of Purkinje cells. Connections in the cerebellar cortex. Glial elements of the cerebellum. The nuclei of the white matter of the cerebellum. Development, structure and functional significance, age-related features of the structure of the brain. Bark relief, layered structure. Cyto- and myelo-architectonic principles of classification of the cerebral cortex into regions and fields. Granular and agranular types of the cerebral cortex. The concept of the blood-brain barrier, its structural elements and functional significance.

### **Тема 13. Nervous system. The cerebral cortex and the cerebellar cortex.**

Лабораторное занятие. The cerebral cortex. Cerebellar cortex.

Revealing knowledge of the general plan of the structure of the brain, myelarchitectonics and cytoarchitectonics of the cerebral cortex, cerebellar cortex. Analysis of afferent and efferent pathways in the cerebral cortex and in the cerebellum. The concept of a module. Study of the structure of the cerebral cortex and the cerebellar cortex on preparations.

### **Тема 14. Sense organs. The organ of sight and smell.**

Лабораторное занятие. Primary sensory organs: organ of sight, organ of smell.

The concept of sensory systems and their three components. The concept of neurosensory and sensory epithelial peripheral parts of the analyzers. The organ of vision is the peripheral part of the visual analyzer. Eyeball and auxiliary apparatus. The development of the structures of the eyeball. Shells of the eyeball. The structure of the sclera and cornea. Vascular membrane and its derivatives - ciliary body, iris, structure and their functional significance. Development of the retina, layers, neural composition. Types, structure and physiology of photoreceptors. Central fovea and blind spot of the retina. Development, structure and significance of the retina. The structure and significance of the vitreous body. The concept of dioptric and accommodative apparatus of the eye, their structural components. Molecular bases of light reception. Age features. Olfactory organ: development, localization, structure, regeneration. Histophysiology of odor perception.

### **Тема 15. Sense organs. The organ of hearing, balance and taste.**

Лабораторное занятие. The organ of hearing and balance, the organ of taste.

Revealing knowledge about the origin and structure of the organ of hearing and balance. Analysis of the structure and functioning of the organ of Corti, ampullar scallops, maculae and taste buds according to dummies and tables. Revealing the common structure of the receptor apparatus of secondary sensory organs. The study of micropreparations of the above organs.

### **Тема 16. The cardiovascular system.**

Лекционное занятие. The cardiovascular system.

Functions of the cardiovascular system. The general principle of the structure of the walls of blood vessels, their vascularization and innervation. Classification of arteries. Classification of hemocapillaries by diameter, wall structure and shape, function. Meaning

and classification of veins, valves of veins. The concept of the vessels of the microvasculature, its structural components and functional significance. The concept of arteriovenular anastomoses, their classification and function. The structure and function of the lymphatic vessels. Age features of the structure of blood vessels. Development, general plan of the structure and function of the heart. Age features in the structure of the heart. Endocardium, its structure, derivatives of the endocardium (valves). Myocardium, structural and functional unit of the myocardium. Types of cardiomyocytes, their structural and functional features. The conducting system of the heart, its divisions and significance. The structure and significance of the epi- and pericardium.

Лабораторное занятие. The cardiovascular system. Vessels. Heart.

Revealing knowledge about the function of the cardiovascular system, about the principle of the structure of the walls of blood vessels, their vascularization and innervation, about the classification of blood vessels. The concept of the vessels of the microvasculature, its structural components and functional significance. The structure and function of the lymphatic vessels. Analysis of the structure of blood vessels in the course of filling out a comparative table and micropreparations.

#### **Тема 17. Hematopoietic organs. The structure of the thymus and lymph node.**

Лабораторное занятие. Organs of hematopoiesis and immune system: thymus, lymph node.

The principle of the structure of the hematopoietic organs, the structural features of the thymus and the lymph node. Focusing the attention of students on the relationship between the structure of the lymphoid organ and its function, the stages of differentiation of lymphocytes in the thymus and lymph node. Solution of situational problems. Analysis of the structure of the thymus and lymph node on micropreparations.

#### **Тема 18. Hematopoietic organs. The structure of the spleen and tonsils.**

Лекционное занятие. Organs of hematopoiesis and immune system: thymus, lymph node.

The principle of the structure of the hematopoietic organs, structural features of the thymus and lymph node. Focusing the attention of students on the relationship between the structure of the lymphoid organ and its function, the stages of differentiation of lymphocytes in the thymus and lymph node. Organs of hematopoiesis and immune system: bone marrow, spleen, tonsils, lymphoid follicles of internal organs.

Лабораторное занятие. Organs of hematopoiesis and immune system: bone marrow, spleen, tonsils, lymphoid follicles of internal organs.

Revealing knowledge about the structural features of the bone marrow, spleen, lymphoid follicles of internal organs. Focusing students' attention on differences in the structure of the lymphoid nodules of the spleen, lymph nodes, tonsils. Solution of situational problems. Analysis of the structure of the above-mentioned organs according to micropreparations.

#### **Тема 19. Digestive system. Study of the esophagus and stomach.**

Лекционное занятие. General plan of the structure of the alimentary canal. Esophagus. Stomach. Intestines.

The general plan of the structure of the esophagus, stomach, intestines. The structure of the membranes of the esophagus, stomach. The relationship of the structure of the mucous membrane with the function performed. Structure and embryonic development of the esophagus. Features of the structure of the glandular cells of the stomach. Topography and significance of the endocrine cells of the stomach. The structure of the intestinal lining. The relationship of the structure of the mucous membrane with the function performed. The structure of the duodenum, jejunum and ileum, large intestine. Features of the structure of glandular cells of the intestinal epithelium. Topography and significance of intestinal

endocrine cells. The value of the villus-crypt system in the processes of parietal digestion, absorption and regeneration. Features of the structure of the large intestine, the structure and function of the lymph nodes of the appendix. Features of the blood supply and innervation of the organs of the digestive tube.

Лабораторное занятие. General plan of the structure of the alimentary canal. Esophagus. Stomach.

Revealing knowledge about the general plan of the structure of the sections and membranes of the gastrointestinal tract, about the relationship between the structure of the mucous membrane of different sections and the functions performed. Analysis of the topography and significance of the endocrine cells of the gastrointestinal tract

Analysis of the topography and significance of exocrine cells of the gastrointestinal tract.

## **Тема 20. Digestive system. Study of the small and large intestines.**

Лабораторное занятие. Общий план строения пищеварительного канала. Кишечник.

Выявление знаний об общем плане строения отделов и оболочек желудочно-кишечного тракта, о связи строения слизистой разных отделов с выполняемыми функциями. Разбор топографии и значения эндокринных клеток ЖКТ

Разбор топографии и значения экзокринных клеток ЖКТ.

## **Тема 21. Digestive system. The study of the structures of the liver, pancreas.**

Лекционное занятие. Digestive system. Liver and pancreas.

Sources of development of the liver and pancreas. Liver, structural features, functions. The structure of the "classical" liver lobule. Features of blood circulation in the liver. Morphological features of the pancreas, the structure of the exocrine and endocrine sections, cell types of pancreatic islets, their functional significance. Age features of the structure of the liver and pancreas.

Лабораторное занятие. Liver and pancreas.

Revealing knowledge about the development, structural features, features of blood circulation and innervation of the liver and pancreas. Analysis of the structure of the hepatic beam and the exocrine and endocrine parts of the pancreas using preparations, micrographs and posters.

## **Тема 22. Endocrine organs. The structure of the epiphysis, thyroid and parathyroid glands.**

Лабораторное занятие. Endocrine system: classification, hypothalamus, pineal gland, pituitary gland, adrenal glands, thyroid gland, parathyroid glands.

Endocrine system: classification, hypothalamus, pineal gland, pituitary gland.

Revealing knowledge about the classification of endocrine glands, about the structure and functional significance of the hypothalamus, about the hormone-producing cells of the anterior, middle and posterior lobes of the pituitary gland. The study of the morphological features of hormone-producing cells, the principle of feedback in their functioning. Analysis of the features of the circulation of the pituitary gland. Revealing knowledge about the pineal gland. The study of the pituitary and epiphysis according to posters and micropreparations.

## **Тема 23. Endocrine Organs. The structure of the pituitary, hypothalamus, adrenal glands.**

Лекционное занятие. Endocrine system: classification, hypothalamus, pineal gland, pituitary gland, adrenal glands, thyroid gland, parathyroid glands.

General characteristics and functional significance of the organs of the endocrine

system. Communication with the central nervous system, the concept of neurosecretory cells. Classification of endocrine glands. The structure and functional significance of the hypothalamus. Nuclei of the hypothalamus, neurohormones and their significance. Development and structure of the pituitary gland. Tropic hormones of the adenohypophysis. The principle of feedback in their action. Cellular composition of the anterior lobe, hormones, objects of application of their action. Structural and functional unit of the middle lobe, hormones, meaning. Development and structure of the posterior lobe, hormones, place of their formation, physiological significance. Features of the circulation of the pituitary gland. Pineal gland. Development, structure, connection with the retina. Hormonal activity, functional significance. Age features of the morpho-functional organization of the hypothalamic-pituitary system. Development and structure of the thyroid gland. Types of hormone-producing cells. Regulatory effect of adenohypophysis hormones. Development, localization and structure of the parathyroid glands. Hormones and their physiological significance. Development and structure of the adrenal cortex and medulla. Zones of the cortical substance and hormones produced in them. Significance for the body. Cellular composition of the adrenal glands. Meaning. Regulatory influence of ACTH of the adenohypophysis. Endocrine cells of internal organs (APUD-system).

Лабораторное занятие. Endocrine system: adrenal glands, thyroid gland, parathyroid glands.

Revealing knowledge about the development, localization and structure of the adrenal glands, thyroid, parathyroid glands. Analysis of the composition of endocrinocytes, the hormones produced by them and their physiological significance. The study of the structure of the adrenal glands, thyroid, parathyroid glands according to tables, microphotographs and micropreparations.

#### **Тема 24. Respiratory system. Study of pathways and lungs. Features of development. Their structure, distinctive features.**

Лабораторное занятие. Respiratory system.

Revealing knowledge about the development and structure of the air-bearing and respiratory department of the respiratory system. Analysis using preparations, tables and micrographs of morphological differences of bronchi of various calibers. The study on micropreparations of the respiratory section of the lungs, the structure of the acinus, the nature of the epithelium of the alveoli, the structural components of the air-blood barrier, the surfactant alveolar complex.

#### **Тема 25. Skin. Study of the structure of its layers. Development, change.**

Лабораторное занятие. Skin and its derivatives.

The study of the development and tissue composition of the skin, skin functions. On micropreparations, the study of the layers of the epidermis, dermis and hypodermis.

#### **Тема 26. The excretory system. Kidneys and excretory tracts. Structure, features of development, functions.**

Лекционное занятие. Urinary system.

Structural components of the urinary organs. Kidney development. The functions of the kidneys. Structure (cortex and medulla). Renal pyramids and brain rays. The structural and functional unit of the kidney is the nephron. Components of the nephron. Features of the blood circulation of the kidney. The structure of the renal corpuscle, a wonderful arterial network. Components of a filtration barrier. The functional significance of various departments of the nephron. Endocrine apparatus of the kidneys. Urinary tract: components, wall structure, significance.

Лабораторное занятие. Urinary system.

Revealing knowledge about the development and structure of the urinary organs. Analysis of the structural and functional unit of the kidney - the nephron. Studying with the

help of tables the features of the blood circulation of the kidney, the components of the filtration barrier, the endocrine apparatus of the kidneys. The study of the structure of the walls of the urinary tract on micropreparations.

**Тема 27. Male reproductive system. Features of development.**

Лабораторное занятие. Male reproductive system.

Revealing knowledge about the development and structure of the organs of the male reproductive system. The study of the structure of the wall of the convoluted seminiferous tubules, direct tubules, ducts of the epididymis, the cellular composition of the epithelium lining them on micropreparations. Analysis of the endocrine function of the testes, regulating the influence of hormones of the adenohypophysis.

**Тема 28. Female reproductive system. Features of development. Menstrual cycle.**

Лекционное занятие. Organs of the female reproductive system: ovary, uterus.

Structural components of the female reproductive system. Development and function of the ovaries. The structure of the ovaries, cortex and medulla. Structural components of the cortical substance: primary or primordial follicles, growing follicles of varying degrees of maturity, atretic follicles, yellow and white bodies. Ovogenesis, stages and periods. Follicular atresia. Graaffian bubble. The essence of the process of ovulation. Oocyte maturation. Formation and stages of development of the corpus luteum. Hormone of the corpus luteum Endocrine function of the ovaries. Oviducts and uterus: development, structure, function. Sexual (menstrual) cycle, periods, essence, hormonal regulation. Mammary gland, changes in the morphology of the gland in embryogenesis and ontogenesis, hormonal regulation of the morphofunctional state of the mammary gland. Human placenta, its formation, structure, functions.

Лабораторное занятие. Organs of the female reproductive system: ovary, uterus, ovarian-uterine cycle.

Revealing knowledge about the development, structure and functioning of the ovaries. Revealing basic knowledge about ovogenesis. Analysis of the essence of the process of ovulation and the endocrine function of the ovaries. The study of the structure of primordial, primary, secondary, tertiary, atretic follicles and the corpus luteum on micropreparations. The study of the structure of the uterus - a hollow tubular organ.

**Тема 29. Female reproductive system. Breast. Placenta. The mother-fetus relationship.**

Лабораторное занятие. Organs of the female reproductive system: fallopian tubes; menstrual cycle, mammary gland, placenta.

Revealing knowledge about the development, structure and functioning of the mammary gland, placenta. Analysis of changes in the morphology of the gland in embryogenesis and ontogenesis, hormonal regulation of the morphofunctional state of the mammary gland. The study of preparations of the fetal and maternal parts of the placenta on micropreparations.

**Раздел 4. Section 4. Histological structure and morphogenesis of the organs of the oral cavity**

**Тема 30. The structure of the oral mucosa, the structure of the tongue and major salivary glands.**

Лекционное занятие. General characteristics of the digestive system. The structure and development of the organs of the oral cavity. Language. Salivary glands.

The general plan of the structure of the hollow organs of the digestive system and features of histogenesis. Features of the structure of the oral mucosa. General plan of the structure of the language. Papillae of the tongue. Taste buds. General plan of the structure of the salivary glands. Terminal sections and excretory ducts of the salivary glands. Large salivary glands - parotid, sublingual, submandibular structure, functions, features of

secretory products.

Лабораторное занятие. General characteristics of the organs of the oral cavity. The structure of the oral mucosa. Language.

Revealing knowledge about the general plan of the structure of the hollow organs of the digestive system and the features of histogenesis. Analysis of the structure of the organs of the oral cavity (lips, cheeks, gums, hard and soft palate, tongue) in the course of filling out the table "Comparative characteristics of the organs of the oral cavity", as well as according to tables and micropreparations. Solution of situational problems.

Salivary glands.

Identification of basic knowledge about the classification of glands by morphotypes, by type of secret and by type of secretion, about the general plan of the structure of the salivary glands and the features of their histogenesis. Analysis of the structure of the large salivary glands (parotid submandibular and sublingual) in the course of filling out the table "Comparative characteristics of the large salivary glands", as well as. on posters and micropreparations. Solution of situational problems.

### **Тема 31. Tooth development. The structure of the tissues of the tooth.**

Лекционное занятие. Development and change of teeth. The structure of the tooth.

Development of teeth, stages and their characteristics. The structure and chemical composition of hard tissues of the tooth - enamel, dentin and cementum. Dental pulp, structural features, blood supply, innervation, physiological significance. The structure and significance of the supporting apparatus of the teeth (gums, gingival pocket, dental alveoli, periodontium).

Лабораторное занятие. Tooth development. The structure of a mature tooth.

Revealing knowledge about the stages of tooth development, about the structure of the enamel organ, about amelogenesis and dentinogenesis, about the structure and origin of enamel, dentin, pulp, cementum and periodontium. Focusing students' attention on the chemical composition, physical structure, trophism of enamel, dentin, cement and periodontium.

### **Тема 32. Face development. Gill apparatus.**

Лабораторное занятие. Gill apparatus and its derivatives.

The study of tables on the development of the maxillofacial region and derivatives of the gill apparatus. Solution of situational problems. Anomalies of development.

## **Раздел 5. Final examination work**

### **Тема 33. Test**

Лекционное занятие.

### **Тема 34. Final exam**

Лекционное занятие.

## **5. Educational technologies**

To implement the competence-based approach in the study of the discipline (module), extensive use of active and interactive methods of conducting classes in the educational process is provided:

In order to form and develop the professional skills of students in the course of practical work, it is planned to solve situational problems, hold mini-conferences, educational games, use computer training programs, and multimedia demonstrations. The following educational technologies are used in the educational process of the Department of General and Clinical Morphology and Forensic Medicine:

Problem lecture - involves the presentation of educational material in the form of problem situations and the involvement of students in a joint analysis and search for solutions. The problematic content of the lecture should be conveyed in a problematic form.

Lecture-visualization using computer technology. The lecture material is accompanied by slides shown during the lecture.

Lecture "press conference". The teacher asks the listeners to ask him in writing within 2-3 minutes a question of interest to each of them on the announced topic of the lecture. Then the teacher systematizes these questions according to their content within 3-5 minutes and begins to give a lecture.

Heuristic conversation is a certain series of questions that direct students' thoughts and answers in the right direction. A heuristic conversation is considered successful if the questions were correctly posed and the students gave the correct answers.

Training in an active form is an active form of training, the main time of the training is occupied by various exercises and games, after which the analysis of these exercises is carried out, and the participants receive feedback from each other and from the trainer.

Work in small groups - students perform group tasks recorded on cards.

Business and role-playing games - the implementation by co-learners of a practical solution to a clinical situation, during which each participant performs a certain role, determined by the teacher. The teacher directs and controls the implementation of the clinical situation.

Lecture-consultation - a lecture is read by an invited specialist using various interactive technologies, such as "lecture-visualization", "lecture-press conference", information and communication technologies.

## **6. Forms of control and types of evaluation materials for the discipline (module)**

Intermediate attestation - evaluation of intermediate and final results of training in the discipline (module).

### **6.1. Sample list of questions for the credit test**

1. Fertilization, features and chronology of the process.
2. Crushing. Specificity of crushing in humans and the chronology of the process.
3. Implantation: chronology of the process, trophoblast differentiation, formation of primary and secondary chorionic villi. Histiotrophic type of nutrition.
4. Gastrulation: chronology of processes, phases. The formation of germ layers and provisional organs as a result of gastrulation.
5. Morphofunctional and genetic classification of epithelial tissue. Integumentary epithelium. Construction of single-layer epithelium. Regeneration.
6. Integumentary epithelium. Construction of stratified epithelium. Regeneration.
7. Physiological and reparative inspection of epithelia.
8. Glands, their classification. Characteristics of the terminal sections and excretory ducts of the exocrine glands. Cytological characteristics of epithelial cells that secrete secrets according to holocrine, apocrine and merocrine properties. Features of the structure of the endocrine glands.

9. Blood. The main components of blood as tissues are plasma and formed elements. Classification of blood cells.
  10. Erythrocytes: size, shape, structure and functions.
  11. The content of formed elements in the blood of an adult. Platelets: size, structure, life expectancy, functions.
  12. Basophils: content, size, shape, structure, main functions. Leukocyte formula.
  13. Eosinophils: content, size, shape, structure, function. Leukocyte formula.
  14. Neutrophils: content, size, shape, structure, function. Leukocyte formula.
  15. The main components of blood as tissue. Monocytes: number, size, structural features, functions. Leukocyte formula.
  16. The main components of blood as tissue. Lymphocytes: number, size, structural features, functions. Leukocyte formula.
  17. Post-embryonic hematopoiesis: physiological inspection of blood. The concept of blood stem cells (HSC) and colony-forming units (CFU). Lymphopoiesis.
  18. Post-embryonic hematopoiesis: physiological inspection of blood. Stages of development of erythrocytes. regulation of erythropoiesis.
  19. Granulocytopoiesis.
  20. Thrombopoiesis.
  21. General characteristics of connective tissues. Classification. Sources of development.
  22. Fibrous connective tissues. Fibroblasts, their features, structure, participation in the processes of fibrillogenesis.
  23. Macrophages, their purpose, types, structure, role in the body. The concept of the system of mononuclear phagocytes.
  24. Plasma cells, their purpose, structure, role in humoral immunity.
  25. Humoral immunity. Features of cooperation of macrophages, T- and B-lymphocytes.
  26. Cellular immunity. Features of cooperation of macrophages, T- and B-lymphocytes.
  27. Mast cells, their purpose, structure, functions.
  28. Intercellular substance: general characteristics. Synthesis of collagen fruits.
  29. Dense fibrous connective tissue, its features, structure and functions. Dry as an organ.
  30. Specialized connective tissues. Adipose tissue, its type, structure and significance.
  31. Pigment tissue, structural features, meaning.
  32. General characteristics of skeletal tissues. Classification.
  33. Lamellar bone tissue: localization in the body, morphofunctional characteristics. The structure of the osteon.
  34. Cells of bone tissue: osteocytes, osteoblasts and osteoclasts. Their cytofunctional characteristics.
  35. Reticulofibrous (coarse fibrous) bone tissue: localization in the body, morphofunctional characteristics.
  36. Histogenesis of bone in place of cartilage (indirect osteogenesis). Bone as an organ.
  37. Histogenesis of bone from mesenchyme (direct osteohistogenesis). Factors affecting the structure of bone tissue.
  38. Cartilaginous tissues. Kinds. General characteristics: cells and intercellular substance. The structure of hyaline cartilage. Age changes.
  39. Cartilaginous tissues. Kinds. General characteristics: cells and intercellular substance. Structure of elastic cartilage.
  40. Muscle tissue. General characteristics.
  41. Somatic striated muscle tissue. Development, morphological and functional

characteristics, regeneration. The structure of the myofibril, its structural and functional unit is the sarcomere.

42. Muscle tissue. General characteristics. Cardiac striated muscle tissue. Source of development.

43. Morphofunctional characteristics of working and conducting cardiomyocytes. regeneration possibilities.

44. Smooth muscle tissue. Sources of development. Morphological and functional characteristics. Regeneration.

45. Nervous tissue. General characteristics. neurocytes. Sources of development. Morphological and functional classification. General plan of the structure of a neuron.

46. Nervous tissue. General characteristics. Neuroglia: general characteristics, sources of development of gliocytes. Macroglia. Microglia.

47. Nerve fibers. Features of the formation, structure and function of non-myelinated and myelinated fibers. axonal transport. Fast and slow transport.

48. Nerve endings: classification. Synapses: types, ultrastructure of chemical synapses. The concept of neurotransmitters.

49. Effector endings - motor and secretory. Neuromuscular ending (motor plaque) in skeletal muscle and smooth muscle tissue.

50. Nervous tissue. General characteristics. Receptor nerve endings. The structure of the body of Vater-Pacini.

51. Nervous system. General characteristics. Sensory (spinal and cranial) nerve nodes. Structure, tissue composition. Characteristics of neurons and neuroglia.

52. Spinal cord. General characteristics of the structure. Types of neurons and their participation in the formation of reflex arcs, types of gliocytes.

53. Cerebellum. The structure and neuronal composition of the cortex. Interneuronal connections. Afferent and efferent nerve fibers.

54. The cerebral cortex. Cytoarchetikonika and myeloarkhetikonika layers. Representation of the modular organization of the cortex.

55. Features of the structure of the cortex in the motor and sensory zones. blood-brain barrier.

56. General plan of the structure of the eyeball. Shells, their divisions and derivatives. Dioptric apparatus of the eye. The structure of the cornea and lens.

57. General plan of the structure of the eyeball. Shells, their divisions and derivatives. Neuronal composition and retinal gliocytes, their morphofunctional characteristics.

58. Organ of hearing. General characteristics of the outer, middle and inner ear. Inner ear: bony and membranous labyrinths. The cochlear part of the membranous labyrinth: the structure of the cochlear canal, the structure and cellular composition of the organ of Corti. Histophysiology of sound perception.

59. Organs of balance. Inner ear: bony and membranous labyrinths. Vestibular part of the membranous labyrinth. Receptor divisions: structure and cellular composition of the spot and ampullar combs.

60. Heart. The structure of the wall of the heart, its membranes, their tissue composition.

61. Myocardium: types of cardiomyocytes, their morphofunctional characteristics.

62. Blood vessels. Classification, general principles of structure, tissue composition.

63. Arteries: classification, structural features and functions of various types of arteries

64. The concept of the microcirculatory bed. Hemocapillaries: classification, structure and function. Organ features of capillaries.

65. Veins: the structure of the vein wall in connection with hemodynamic conditions. Classification. Features of the structure of veins of various types. Organ features of veins.

## **6.2. Sample list of questions for the examination**

## General histology

1. Methods of fabrication of micro preparations. Stages. The types of micro preparations.

## Staining

methods

2. Fertilization. Distant and contact interaction. Zygote as a unicellular embryo.

3. Fertilization. biological significance. Zygote as a unicellular embryo.

4. Crushing. Features of crushing in humen. Morula. Blastocyst. Structure of the embryo

during the

early of crushing.

5. Implantation. Trophoblast differentiation. Formation of primary and secondary chorionic villi.

6. Gastrulation. Stages. The amnion, its structure and meaning.

7. Extra-embryonic organs all: yolk SAC, placenta, allantois

8. Epithelial tissues. Classification. General characteristics. The structure of the simple epithelium. The

basement membrane: structure, functions.

9. Epithelial tissues. Glands, their classification. Characteristics of the secretory ends and excretory

ducts of the exocrine glands. The types of the glandular secretion (holocrine, merocrine, apocrine).

Features of the structure of the endocrine glands.

10. Epithelial tissues. Classification. General characteristics. The structure of the stratified epithelium.

Reparative regeneration of epithelial cells

11. Histo-hematic barriers. structure, meaning.

12. Blood. Classification of the blood elements. The amount of the cells in the human blood. Platelets:

size, structure, lifespan, function.

13. Blood. Classification of the blood elements. The amount of the cells in the human blood. Red blood

cells: size, structure, lifespan, function.

14. Blood. Classification of the blood elements. The amount of the cells in the human blood.

Neutrophils: size, structure, lifespan, function

15. Blood. Classification of the blood elements. The amount of the cells in the human blood. Basophils:

size, structure, lifespan, function

16. Blood. Classification of the blood elements. The amount of the cells in the human blood.

Eosinophils: size, structure, lifespan, function

17. General characteristics of connective tissues. Classification. Sources of development.

## Fibrous

connective tissues. Fibroblasts, their varieties, structure. Synthesis of collagen fibers.

18. General characteristics of connective tissues. Classification. Sources of development.

## Fibrous

connective tissues. Macrophages, their origin, types, structure, role in the protective reactions of

the body.

19. General characteristics of connective tissues. Classification. Sources of development.

## Fibrous

connective tissues. Plasma cells, their origin, structure, role in humoral immunity.

20. Immunity. The concept of antigens and antibodies. Humoral immunity.

21. Immunity. The concept of antigens and antibodies. Cellular immunity.
22. General characteristics of connective tissues. Classification. Sources of development.
- Fibrous connective tissues. Intercellular substance: general characteristics. Collagen and elastic fibers, their role, structure and chemical composition.
23. Dense fibrous connective tissue, its varieties, structure and functions. Tendon as an organ
24. Specialized connective tissues. Pigment tissue, structural features, meaning.
25. The skeletal tissue. General structure. classification. sources of development.
- Lamellar bone tissue:  
localization in the body, morphofunctional characteristics. The structure of osteon.
26. The skeletal tissue. General structure. classification. sources of development. Bone tissue cells:  
osteocytes, osteoblasts and osteoclasts. Their cito-functional characteristics.
27. The skeletal tissue. General structure. classification. Histogenesis of bone in place of cartilage  
(indirect osteohistogenesis). Bone as an organ.
28. Cartilage tissue. Types. General characteristics: cells and intercellular substance. The structure of elastic cartilage.
29. Cartilage tissue. Types. General characteristics: cells and intercellular substance. The structure of hyaline cartilage. Age-related changes.
30. Muscle tissue. General characteristics. Striated muscle tissue. Development, morphological and functional characteristics, regeneration. The structure of the muscle fibers, and its structural and functional unit - sarcomere.
31. Muscle tissue. General characteristics . types, main characteristics. development. physiology of muscle contraction.
32. Muscle tissue. General characteristics. Cardiac striated muscle tissue. The source of development.  
Morphofunctional characteristics of working and conducting cardiomyocytes.
- Regeneration possibilities.
33. Classification, general morphofunctional characteristics of muscle tissue. Smooth muscle tissue.  
Sources of development. Morphological and functional characteristics. Regeneration.
34. Nerve tissue. General characteristics. Neurocytes. Sources of development.
- Morphological and functional classification. General outline of the neuron structure.
35. Nervous tissue. General characteristics. Neuroglia: classification, sources of development, function.
- Private Histology
1. The spinal cord. structure. types of neurons. formation of the reflex arches
  2. the cerebellum. structure. interneuronal connections. afferent and efferent nerve fibers.
  3. the cerebral cortex. cytoarchitectonics and myeloarchitectonics. Blood-brain barrier.
  4. dioptric apparatus of the eye. structure of the lens

5. accommodative system of the eye

6. General plan of the structure of the eyeball

7. the organ of hearing. the outer ear. middle ear. the inner ear.

8. the heart. the structure of the walls. hearts. shells. fabric composition. myocardium.

Types of

cardiomyocytes. their characteristics.

9. blood vessels. classification. General principles of structure. Arteries. Veins.

Microcirculatory bed

10. bone marrow, structure and tissue composition. features of blood supply

11. thymus. structure of the tissue composition. features of blood supply. Hemato-thymic

barrier

12. spleen. structure of the tissue composition. features of blood supply. Function of the

organ

13. lymph nodes . structure of the tissue composition. features of blood supply. Function

of the organ

14. tonsils. Location, function, age changes

15. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Hard palate.

16. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Soft palate.

17. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Lips

18. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Tongue

19. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Oral floor

20. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Cheeks

21. the oral cavity. organs of the oral cavity. features of the structure. Types of the oral mucosa. Gums

22. Tongue, features of the structure, the mucous membrane of the tongue. Tongue development

23. Tooth development, Stages, tooth structure .Enamel

24. Tooth development, Stages, tooth structure .Dentine

25. Tooth development, Stages, tooth structure .Cementum

26. Tooth development, Stages, tooth structure .Periodontium

27. Tooth development, Stages, tooth structure .Pulp

28. specialized lymphoid formations of the oral cavity. Tonsils.

29. Major salivary glands

30. the Gill apparatus and the development of the human face

31. the throat. the esophagus. the structure of the walls.

32. stomach, duodenum, small and large intestines, development, features of the structure of the walls.

33. liver, the structure of the classical lobule of the liver. liver function

34. pancreas, structure. liver function

35. hypothalamus, neuroendocrine neurons of large and small cell nuclei

36. pituitary gland. embryonic development. structure and blood supply

37. epiphysis. structure. cellular composition and function and age-related changes.

38. the adrenal glands. sources of development. the cellular structure. the structure of the cortical and medulla.

39 the thyroid gland structure of the follicle. Follicular cells. their hormones and the

phase of secretion.

Parafollicular C cells.

40. the parathyroid gland. structure. the cellular structure. the role of b in the regulation of mineral metabolism.

41. nasal cavity, larynx, trachea, main bronchi. tissue composition of the shells. cellular composition of the

mucous membrane.

42. lungs, respiratory Department. acinus is a morphofunctional unit of the lung.

43. skin, features of structure and regeneration.

44. glands of the skin, structure and histophysiology

45. hair, structure. hair growth and change

46. urinary tract . the structure of the ureter and bladder.

47. kidney, cortical and medulla of the kidney. nephron as a morphofunctional unit of the kidney.

48. endocrine apparatus of the kidney

49. testis. the structure of the spermatic cord.

50. the prostate gland. structure, function, and age-related changes.

51. the ovary. features of the structure. cortical and medullary matter. endocrine function of the gland.

52. appendage of the testicle. structure and functions.

53. menstrual cycle. phases. hormonal regulation. changes in the uterus .

54. the uterus. structure of the walls.

55. the mammary gland. structure. neuroendocrine regulation of function of mammary gland.

56. cotyledon. structural and functional unit of the placenta

### **6.3. Suggested themes of term papers (projects)**

Не предусмотрено

### **6.4. Suggested themes of term projects**

Не предусмотрено

### **6.5. Suggested topics of calculation and graphic works**

Не предусмотрено

## **7. Educational, methodological, informational and software support of the discipline (module)**

The electronic catalog and electronic information resources provided by the scientific library of the FSBEI of HE "I. N. Ulianov Chuvash State University" are available at the link <http://library.chuvsu.ru/>

### **7.1. Regulatory documents, standards and rules**

Федеральный закон "Об основах охраны здоровья граждан в Российской Федерации" от 21.11.2011 N 323-ФЗ

### **7.2. Recommended basic educational and methodological literature**

№ item	Name
1	

### **7.3. Recommended supplementary educational and methodological literature**

№ item	Name
1	

#### 7.4. List of resources of the "Internet" information and telecommunication network

№ item	Name	Link to the resource
1	Научная библиотека ЧувГУ	<a href="http://library.chuvsu.ru">http://library.chuvsu.ru</a>
2	Электронно-библиотечная система IPRBooks	<a href="http://www.iprbookshop.ru">http://www.iprbookshop.ru</a>
3	Электронная библиотечная система «Юрайт»: электронная библиотека для вузов и ссузов	<a href="https://www.biblio-online.ru">https://www.biblio-online.ru</a>
4	ЭБС «Издательство «Лань»	<a href="https://e.lanbook.com/">https://e.lanbook.com/</a>
5	Консультант студента. Электронная библиотека медицинского вуза	<a href="http://www.studmedlib.ru/">http://www.studmedlib.ru/</a>

#### 7.5. Software, professional databases, information and reference systems, electronic educational resources and electronic library systems

Software, professional databases, information and reference systems provided by the Informatization Department of the FSBEI of HE "I.N. Ulianov Chuvash State University" are available for download at the link <http://ui.chuvsu.ru> //. The Unified Register of Russian programs for electronic computers and databases, including freely distributed ones, is available at the link [reestr.minsvyaz.ru/reestr](http://reestr.minsvyaz.ru/reestr) /.

##### 7.5.1. Licensed and freely distributed software

Microsoft Windows operating System and/or Unix-like operating system and/or mobile operating system;

Office software packages:

Microsoft Office and/or LibreOffice

and (or) OpenOffice and (or) analogues;

Browsers, including Yandex.Browser.

List of software:

##### 7.5.2. Lists of professional databases and (or) information reference systems and (or) electronic library systems and (or) electronic educational resources

#### 8. Material and technical support of the discipline

Classrooms for lecture-type classes in the discipline are equipped with a teacher's automated workplace consisting of: a personal computer/laptop, multimedia equipment with a screen and (or) SMART interactive whiteboard/SMART TV.

The premises for students' independent work are equipped with computer equipment enabling to connect to the Internet and provide access to the electronic information and educational environment of the FSBEI of HE "I.N. Ulianov Chuvash State University".

№ item	Lesson type	Brief description and characteristics of the composition of installations, measuring and diagnostic equipment, computer equipment and experimental automation tools
1		

## **9. Means of adapting the discipline teaching to the needs of persons with physical conditions**

If necessary, persons with physical conditions can be offered one of the following options for perceiving information, taking into account their individual psychophysical characteristics:

- 1) using e-learning and distance learning technologies.
- 2) using special equipment (enginery) and software in accordance with the students' health restrictions in the Training Centers for Persons with Disabilities and Physical Conditions (hereinafter referred to as special needs) available at the university.

In the course of training, if necessary, the following conditions are provided for persons with visual, hearing and musculoskeletal disorders:

- for persons with visual impairments: educational and methodological materials in printed form in enlarged font; in the form of an electronic document; in the form of an audio file (conversion of educational materials into audio format); in printed form in Braille; individual consultations involving a tactile interpreter; individual assignments and consultations.

- for people with hearing impairments: educational and methodological materials in printed form; in the form of an electronic document; video materials with subtitles; individual consultations involving a sign language interpreter; individual assignments and consultations.

- for persons with disorders of the musculoskeletal system: educational and methodological materials in printed form; in the form of an electronic document; in the form of an audio file; individual assignments and consultations.

## **10. Guidelines for students to perform independent work**

The purpose of the student's independent work (IW) is to consolidate the theoretical knowledge gained and to acquire practical skills in using and performing research of algorithms and data structures when designing application software programs. IW includes independent study of educational issues, preparation for laboratory classes, performing calculation and graphic work, preparation for a test and an exam.

The list of questions and tasks for independent work to prepare for laboratory classes is given in the corresponding methodological instructive regulations in the description of each laboratory work.

The list of questions and tasks for independent work to carry out calculation and graphic work is given in the relevant methodological instructive regulations.

Independent work of students is an integral part of the educational process. The purpose of independent work is to prepare a modern competent specialist and develop abilities and skills for continuous self-education and professional improvement.

Realization of this goal involves the solution of the following tasks:

- high-quality development of theoretical material in the discipline under study, deepening and expanding theoretical knowledge with a view to their application at the level of interdisciplinary connections;

- systematization and consolidation of the received theoretical knowledge and

practical skills;

- formation of skills for the search and use of normative, legal, reference and special literature, as well as other sources of information;
- development of cognitive abilities and activity, creative initiative, independence, responsibility and organization;
- formation of independent thinking, abilities for self-development, self-education, self-improvement and self-realization;
- development of research skills;
- formation of the ability to solve practical problems (in professional activities), using the acquired knowledge, abilities and skills.

Independent work is determined by the specifics of the discipline and the methodology of its teaching, the time provided by the curriculum, as well as the level of study at which the discipline is studied. The main forms of organization of independent work of students are: classroom independent work under the guidance and supervision of a teacher (at lectures, practical classes and consultations); extracurricular independent work under the guidance and supervision of a teacher (at consultations, during research work), extracurricular independent work without the direct participation of a teacher (preparation for classroom studies, olympiads, conferences, performing tests, working with electronic information resources, preparing for exams and offsets). Independent work of students is provided by these methodological recommendations.

Independent work of students on the course "Histology, Embryology, Cytology" is a necessary component of the training of a specialist in the field of medicine.

Out-of-class independent work is the planned educational, educational-research, research work of students, performed outside the classroom on the instructions and with the methodological guidance of the teacher, but without his direct participation. The purpose of independent work of students is to master the fundamental knowledge of the theory of forecasting, professional skills and abilities to conduct econometric calculations, experience in creative, research activities.

Independent work of students is aimed at solving the following problems:

- formation of an idea about the application of forecasting models to the study of the economic system, about the socio-economic content as an integral part of modern analytical research;
- formation of skills for collecting, analyzing and pre-model processing of statistical data;
- study, compilation and analysis of modern statistical forecasting models (basic regression models, time series models and systems of simultaneous equations);
- mastering the techniques and methods for calculating statistical forecasting models using modern computer technology, meaningful interpretation of models.

## **11. Methodological instructive regulations for students studying the discipline (module)**

The discipline "Histology, Embryology, Cytology" allows students to instill in students the skills to apply basic knowledge about the structure of a cell, tissue, organ to recognize them in the norm and subsequently in pathology. Therefore, students should rely mainly on the knowledge and skills gained in lectures and laboratory classes. This provides the necessary basis for further in-depth study of other disciplines. However, this knowledge needs to be activated.

Forms of independent work of students, provided for by the discipline:

- Preparation for laboratory classes independent study of educational issues;
- Exam preparation.

For self-preparation for laboratory classes, studying educational issues, preparing for the exam, the following sources can be recommended:

- lecture notes and practical training materials;

- educational literature of the relevant profile.

At the beginning of the course, the teacher informs students about the forms, types and content of independent work, explains the requirements for the results of independent work, as well as the forms and methods of control and evaluation criteria.

### **11.1. Methodological instructive regulations for preparing for seminar-type classes**

The leading didactic goal of laboratory work is experimental confirmation and verification of essential theoretical provisions (laws, dependencies). The content of laboratory work can be the study of the histological structure, the identification of differentiating features. In the course of completing tasks, students develop practical skills and abilities in handling microscopic equipment, as well as research skills (observe, compare, analyze, establish dependencies, draw conclusions and generalizations, independently conduct study).

Laboratory work can be reproductive, partially - search and search character.

Works that are of a reproductive nature are distinguished by the fact that during their implementation, students use detailed instructions that indicate: the purpose of the work, explanations (theory, main characteristics), equipment, equipment, materials and their characteristics, the order of work, tables, conclusions ( without wording), control questions, educational and special literature.

Works that are partially exploratory in nature are distinguished by the fact that during their implementation, students do not use detailed instructions, they are not given the procedure for performing the necessary actions, and require students to independently select equipment, choose ways to perform work in instructive and reference literature, etc. .

Research works are characterized by the fact that students must solve a new problem for them, based on their theoretical knowledge.

Forms of organization of students in laboratory work: frontal, group and individual.

With the frontal form of organizing classes, all students perform the same work at the same time.

In the group form of organizing classes, the same work is performed by teams of 2-5 people.

With an individual form of organizing classes, each student performs an individual task.

Preparation of a written report on the work performed in accordance with the requirements.

Grades for laboratory work are taken into account as an indicator of the current progress of the student.

### **11.2. Methodological instructive regulations for preparing for an examination**

Preparing students for the exam includes:

- viewing the program of the training course;
- determination of the sources necessary for the preparation (textbooks, additional literature, etc.) and their study;
- use of lecture notes, practical training materials;
- Counseling with a teacher.

Preparation for the exam begins with the first lesson in the discipline, where students receive a general attitude from the teacher and a list of basic requirements for current and final reporting. At the same time, it is important to systematically master the material from the very beginning, guided primarily by the list of questions for the exam, and outline the sources that are important for solving educational problems. During the semester, there is a replenishment, systematization and adjustment of learning developments, the development of new and consolidation of already studied material.

The exam aims to evaluate the work of a student for a certain course: the theoretical

knowledge gained, its strength, the development of logical and creative thinking, the acquisition of independent work skills, the ability to analyze and synthesize the knowledge gained and put into practice the solution of practical problems.

The exam is held in writing on tickets approved by the head of the department. The examination ticket includes two questions and tasks. The wording of the questions coincides with the wording of the list of questions brought to the attention of students one month before the examination session. In the process of preparing for the exam, a pre-exam consultation was organized for all study groups. The result of the exam is expressed as "excellent", "good", "satisfactory".

In order to clarify the assessment, the examiner can ask no more than one or two additional questions that do not go beyond the requirements of the work program. An additional question is a question that is not related to the subject matter of the ticket questions. An additional question, as well as the main questions of the ticket, requires a detailed answer. In addition, the teacher can ask a number of clarifying and leading questions related to the subject of the main questions of the ticket. The number of clarifying and leading questions is not limited.

### **11.3. Methodological instructive regulations for preparing for a test**

Не предусмотрено

### **11.4. Methodological instructive regulations for performing computational and graphical**

Не предусмотрено

### **11.5. Methodological instructive regulations for performing a control work**

Не предусмотрено

### **11.6. Methodological instructive regulations for performing a course work (project)**

Не предусмотрено

### List of additions and changes

The name and details (if any) of the document attached to the Working Program of the discipline (module) containing the text of updates	Department's decision		Full name of department head:
	Date	Protocol №	