MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

DEPARTMENT OF HISTOLOGY, CYTOLOGY AND EMBRYOLOGY

APPROVED
Acting Vice Rector for Science and Education
_____ Svetlana KOTYUZHYNSKA
01 September 2022

CURRICULUM (WORKING PROGRAM) ON THE DISCIPLINE «HISTOLOGY, CYTOLOGY AND EMBRYOLOGY»

Level of higher education: second (master's)

Field of knowledge: 22 "Health"

Specialty: 222 " Medicine"

Educational and professional program: Medicine

2022

The program is based on the educational-professional program "Medicine", training of specialists of the second (master's) level of higher education in the specialty 222 "Medicine" in the field of knowledge 22 "Health", approved by the Academic Council of ONMedU, (Protocol № 9 from 23 June 2022)

Developers:
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Approved at the meeting of the Department of Histology, Cytology and Embryology
Protocol № 21 dated 27.06.2022
Head of the Department _____ Oksana TIRON

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Program is approved by the Methodology Cycle Committee on biomedical disciplines of ONMedU
Protocol № 6 dated 30.06.2022___

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Approved at the meeting of the University Central Coordination and Methodology Council of ONMedU
Protocol № dated "___" _____20__
Head of the Department _____ _____
(signature)

Approved at the meeting of the University Central Coordination and Methodology Council of ONMedU
Protocol № dated "___" _____20__
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1. Description of the primary discipline:

The name of indicators	Field of knowledge, specialty, educational and professional program, level of higher education	Characteristics of the discipline	
		Daytime form of study *Obligatory*	
Total amount: **Credits – 9** **Hours - 270** **Subdivisions of content – 2**	Field of knowledge: 22 "Health" Specialty: 222 "Medicine" Level of higher education: second (master's)	*Preparation year*	*1*
		Semester	*I - II*
		Lectures	*30 hours*
		Practical	*96 hours*
		Independent work	*144 hours*
		incl. individual tasks:	*0*
		Final control form	*Exam*

2. The purpose and objectives of the discipline

Purpose: The student's mastery of knowledge of the microscopic and ultramicroscopic structure of the structures of the human body, their development and changes in various conditions of life.

Tasks:

1. Study of the molecular and structural foundations of the functioning and recovery of cells and their derivatives.
2. Determination of the adaptive and regenerative capabilities of organs, taking into account their tissue composition, regulation features and age-related changes.
3. Interpretation of the patterns of human embryonic development, regulation of morphogenesis processes, determination of critical periods of embryogenesis, defects and anomalies of human development.

The process of studying the discipline is aimed at forming the elements of the following competencies:

- general competencies (GC):

IC – The ability to solve typical and complex specialized tasks and problems in the field of health care in the specialty "Dentistry", in professional activity or in the learning process, which involves conducting research and/or implementing innovations and is characterized by the complexity and uncertainty of conditions and requirements .

GC1. Ability to abstract thinking, analysis and synthesis

GC2. Ability to learn and master modern knowledge

GC4. Knowledge and understanding of the subject area and understanding of professional activity

GC6. Ability to make informed decisions

GC11. Ability to search, process and analyze information from various sources

GC12. Determination and persistence in relation to assigned tasks and assumed responsibilities

GC16. The ability to evaluate and ensure the quality of the work performed

- special competencies (SC):

SC23. Ability to develop and implement scientific and applied projects in the field of health care

SC25. Adherence to professional and academic integrity, to be responsible for the reliability of the obtained scientific results

SC28. Ability to apply fundamental biomedical knowledge at a level sufficient to perform professional tasks in the field of health care

Program learning outcomes (PRL):
PRL1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.
PRL2. Understanding and knowledge of basic and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.
PRL3. Specialized conceptual knowledge that includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems.
PRL21. Search for the necessary information in the professional literature and databases of other sources, analyze, evaluate and apply this information.
Expected learning outcomes. As a result of studying the academic discipline, the student must:
Need to know:
- histological elements and their structural components in light and electron microscopy
- structural features and functional specialization of cells
Be able to:
- to apply knowledge of histology, cytology and embryology in practical situations, namely:
- to apply knowledge of the molecular and structural foundations of the functioning and restoration of cells and their derivatives.
- to interpret the basics of adaptation, reactivity and maintenance of homeostasis.
- to determine the adaptive and regenerative capabilities of organs, taking into account their tissue composition, regulation features and age-related changes.
- to interpret the patterns of human embryonic development, regulation of the processes of morphogenesis.
- to determine the critical periods of embryogenesis, defects and anomalies of human development.
Master skills:
1. Use of microscopic devices.
2. Diagnostics of micropreparations and electronic micrographs by their tissue and cellular composition.

3. Content of the program.
Section 1. General histology.

Topic 1. Introduction of the course of histology, cytology and embryology. Microscope, microscopic instruments. Histological technique. Microscopes. The emergence of histology, cytology and embryology as independent sciences. The main provisions of the cell theory at the present stage of the development of science. Development of histology, cytology and embryology in Ukraine. The modern stage of development of histology, cytology and embryology. The relationship of histology with other sciences of a biomedical profile. Basic principles of light and electron microscopy. Types of micropreparations. Coloring and contrast of preparations. The concept of histological dyes. Microscopy technique in light microscopes. Special methods of light microscopy.

Concept of histochemistry, radioautography, vital research methods. Quantitative research methods. Special research methods.

Topic 2. General organization of the cell. Biomembranes. plasmolemme. Intercellular contacts. Cytoplasm. Cell metabolism. Synthetic apparatus of the cell.

The concept of the cell as an elementary living system. Eukaryotic cell - as the basis of the structure, function, reproduction, development, adaptation and restoration of multicellular organisms. The general plan of the structure of the eukaryotic cell. Modern understanding of biological membranes. Membrane, submembrane and submembrane components of cytolemma, their structural-chemical and functional characteristics. Transmembrane transport of substances. Intercellular interaction. The main components of the cytoplasm are hyaloplasm, organelles, and inclusions. Organelles - definition, classification. Organelles for general and special purposes. Synthetic processes in the cell. The interaction of the structural components of the cell in the synthesis of proteins and non-protein substances. Inclusions - definition, classification, value.

Topic 3. Cytology-2. Nucleus. Reproduction of cells. Aging and death cells.

The importance of the nucleus in the life of a eukaryotic cell, the storage and transmission of genetic information. The shape, size, number of nuclei and nuclear-cytoplasmic ratio in various types of cells. The main components of the nucleus: the nuclear membrane, chromatin, nucleolus, karyoplasm. Life and cell cycles, their characteristics. Mitosis. Biological significance. Endomitosis Polyploidy. Intracellular regeneration. General morphological and functional characteristics, biological significance. Aging and cell death.

Topic 4. The concept of tissue. Epithelial tissue. Types of Simple epithelia. The concept of tissue. Characteristics of histological elements of tissue: cells and their environment. Classification of tissues. Sources of tissue development. Types of regeneration (physiological, reparative). Epithelial tissues. Classification of epithelium. General morpho-functional characteristics of epithelial tissues. Basal membrane: structure, molecular composition, functional significance. Simple epithelia.

Topic 5. Stratified and Glandular epithelia. Stratified epithelia, morpho-functional characteristics. Glandular epithelium. Structure and classification of glands. Secretory cycle. Exocrine glands, structure and function. Types of secretion.

Topic 6. Tissues of the internal environment. Blood. Erythrocytes. Trombocytes. Plasma. Morpho-functional characteristics. Origin, general structure, functions. Mesenchyme. Classification of tissues of the internal environment. Blood. General characteristics. Properties. Functions. Blood composition: plasma and blood cells. Erythrocytes. Number. Size and shape. Life cycle duration. The structure of erythrocytes under light and electron microscopy. Inclusion of hemoglobin, types. Mechanisms of respiratory function of erythrocytes. Platelets, number, size, shape, structure under light and electron microscopy. The role of platelets in hemostasis, inflammation, vascular wall repair. The concept of stages and mechanisms of thrombus formation.

Topic 7. Blood. Granular leucocytes. Agranular leucocytes. Lymph. Clinical significance of blood indicators. Embryonic and postembryonic hematopoiesis. Leukocytes. Classification of leukocytes, their role in the body's protective reactions. Leukocyte formula. Granulocytes and agranulocytes: number, size, structure, chemical composition of granules, functions. Diagnostic value of changes in blood indicators. Age features of the hemogram. The concept of physiological blood regeneration.

Embryonic and postembryonic hematopoiesis (hemocytopoiesis). Embryonic hemocytopoiesis - histogenesis of blood as a tissue. Timing, sequence, localization. Histogenetic ranges: erythropoiesis, granulocytopoiesis, monocytopoiesis, thrombocytopoiesis.

Topic 8. Control of practical skills (diagnosis of slides) according to topics 1-7.

Demonstration by a student of mastering practical skills. Ability to adjust the microscope to work, use low and high magnification lenses, identify the micropreparation by its structural features and tinctorial properties, identify and indicate a certain structure in the specimen. Motivate your answer. To determine ultramicroscopic structures on EM-microphotography, to analyze their functional state according to the features of the structure.

Topic 9. Control of assignment of theoretical knowledge according to topics 1-8 section 1. Demonstration by the student of the assimilation of the KROK 1 tests and theoretical knowledge on topics 1 – 8 with the subsequent analysis of mistakes.

Topic 10. Connective tissue. Cells of loose connective tissue. General characteristics of connective tissues. Classification. Fibrous connective tissue. Their varieties, characteristics, localization, structural composition, functional significance. Loose fibrous connective tissue cells. Classification, sources of formation, morpho-functional features. Interaction of blood cells and connective tissue in inflammation.

Topic 11. Extracellular matrix. Dense connective tissue. Connective tissue with special properties. Extracellular matrix. Ground substance. Structure, chemical composition and functional significance of its elements. Fibers: types of fibers and their role in determining the properties of connective tissue, chemical composition, molecular organization, structure, tinctorial properties, functional significance. Dense fibrous connective tissues, their types, localization, structure and functions. Classification of tissues with special properties (adipose, reticular, pigment, mucous), their localization, structure and function.

Topic 12. Cartilage. Chondrohistogenesis. General characteristics of skeletal tissues (sources of development, structure, functions). Classification. Cartilage and bone tissues. Structural composition. Histogenesis of cartilage tissue. Classification of types of cartilage (hyaline, elastic, fibrous). Cells of cartilage. Extracellular matrix. Fibers. The main ground substance, chemical composition. Varieties of cartilage: localization, features of structure and chemical composition of the matrix, properties, functional significance. Connection of cartilage with the actual connective tissues. Perichondrium, its importance in the nutrition, growth and regeneration of cartilage. Appositional and interstitial growth of cartilage.

Topic 13. Skeletal tissues. Structure of bone tissue. Bone joints. Osteogistogenesis. Bone tissue. General plan of structure and function. Varieties of bone tissue. Woven and lamellar bone tissue. Bone cells: osteoblasts, osteocytes, osteoclasts: localization, metabolism, basic regulators, cytophysiology. Extracellular matrix: components, chemical composition, functional significance. Stages and mechanisms of extracellular matrix formation, role in regulation of calcium homeostasis. Types of bones (flat and tubular). Histoarchitectonics of different zones of the tubular bone. Osteon. Trophic of bone. Connection of bones. Classification. The structure of the joints. Articular cartilage, zones, histo- and cytoarchitectonics, trophic, adaptation to physical activity. Regenerative capabilities of articular cartilage.

Direct and indirect osteogenesis. Stages, regulation. The role of the cartilage model. Ossification centers. Epiphyseal plate, zones. Features of structure and secretory activity of chondrocytes of different zones. Role in ossification mechanisms. Growth of tubular bones in length. The concept of regulators and mechanisms of growth. Bone remodeling under conditions of changes in physical activity. Regulation of hormons.

Topic 14. Muscular tissue. Striated skeletal muscle tissue. General characteristics of muscle tissues: properties, histogenetic and morphological classifications. Muscle fiber as a structural and functional unit of muscle tissue. General structure of skeletal muscle. Skeletal muscle fiber, sources and course of development, structure, characteristics of contraction. Interstitial relations: cooperation of muscle and connective tissues. Endomysium, perimizium, epimizium. Structural basis of muscle fiber growth. Adaptation of skeletal muscle to changes in physical activity. Regeneration of skeletal muscle.

Topic 15. Cardiac and Smooth muscle tissue. Cardiac muscle tissue. Source of development, structure, characteristics of contraction. Types of cardiomyocytes. Smooth muscle tissue. Histogenesis, structure, characteristics of contraction. Smooth myocyte. Organization of the contractile apparatus. Myocytes and myoepithelial cells. Sources of development, features of structure, functional value.

Topic 16. Nervous tissue. Neurocytes. Neuroglia. Nervous tissue General characteristics. Sources of development, structure, functional properties and values. The concept of neurotransmitters. Neurocytes (neurons). Morphological and functional classification.

Neuroglia. General characteristics, classification of gliocytes, sources of development, functional significance.

Topic 17. Nervous fibers and endings. Nerve fibers. General characteristics, classification, characteristics of the impulse. Myelinated and unmyelinated nerve fibers. The concept of structural and molecular basis of impulse conduction. Myelination in the central and peripheral nervous system. Regeneration of nerve fibers. Nerve endings. General morpho-functional characteristics. Classification. Structure, localization, connection with other tissues, functional significance. Synapses: structure, functional significance, mechanisms of regulation. Morphological substrate of reflex activity of the nervous system (the concept of simple and complex reflex arcs).

Topic 18. Control of practical skills (diagnosis of slides) according to topics 9-13. Demonstration by a student of mastering practical skills. Ability to adjust the microscope to work, use low and high magnification lenses, identify the micropreparation by its structural features and tinctorial properties, identify and indicate a certain structure in the specimen. Motivate your answer. To determine ultramicroscopic structures on EM-microphotography, to analyze their functional state according to the features of the structure.

Topic 19. Control of assignment of theoretical knowledge according to topics 9-14 section 1. Demonstration by the student of the assimilation of the KROK 1 tests and theoretical knowledge on topics 9 – 14 of the General Histology section, with the subsequent analysis of mistakes.

Section 2. Special histology.

Topic 20. Nervous system. Spinal and vegetative ganglia. Spinal cord. Peripheral nerves. Nervous system. Cerebral cortex. Cerebellum. Spinal cord. General morphofunctional characteristics. Gray matter: horns, nuclei, neurons, connections with other parts of the CNS. White matter. Anterior, lateral and posterior horns: structural composition, functional significance. Leading paths. Peripheral nervous system: ganglia, peripheral nerves, endings. Somatic reflex arc: structural elements, localization, interneuronal connections, functional significance. Histophysiology of the autonomic (autonomic) nervous system. General morphofunctional characteristics. Autonomic ganglia. Types, sources of development. Structure: tissue composition. Neurons of sympathetic and parasympathetic ganglia: morphological and functional characteristics, gliocytes, fibers. Intramural ganglia: localization, morphological and functional characteristics, neurotransmitters. Vegetative reflex arc: components, localization, neurotransmitters.

Topic 21. Nervous system. Cerebral cortex. Cerebellum. General morphofunctional characteristics. Patterns of development. Classification (anatomical and functional). Central nervous system. Brain cortex. General characteristics: development, structure, functions. Parts. Gray and white matter. Histohematic barriers of the cerebral cortex. Layers: tissue composition, structural features, functions. Cerebrospinal fluid. Cerebral cortex: gyri, furrows, functional fields, morphological types of neurons and functional significance. Neurogliaof cortex. Histophysiology of the cerebral cortex: layers, cytoarchitectonics, myeloarchitectonics. Morphological types of cortex: granular and agranular types, connection with functions.
Cerebellum: localization, structure, functions. Cerebellar cortex: layers, cytoarchitectonics. afferent and efferent fibers. Interneuronal connections in the cerebellar cortex. Communication of the cerebellum with other parts of the CNS. Brain stem: departments, features of structural organization, functional significance.

Topic 22. Sensory systems. Organ of vision. Sensory systems: types, elements, functional significance. General characteristics of the sensory organs, classification. Cellular and molecular basis of reception. Visual analyzer (eye and related structures): elements, their structural components, functional principles. The organ of vision. Sources and course of development. Eyeball: general plan of structure, layers, their parts, tissue composition and functions. Eye cameras. Watery moisture: role in the functioning and trophic of eye structures.

Functional apparatus of the eye: dioptric, accommodation, receptive, auxiliary - structure, functional and diagnostic value. Age- related changes.

Topic 23. Sensory systems. Organ of hearing and equilibrium.

Auditory analyzer: parts, structural components, functional significance. Vestibular analyzer: parts, structural components, functional significance. Ear: sources and course of development, anatomical parts, functional characteristics. External, middle and internal ear: structural components, functional significance. Spiral organ: cell composition, integumentary membrane, cytophysiology of the auditory apparatus. Vestibular part of the membranous labyrinth: utricle, saccule and ampullary crests. Receptor zones, cell composition. Cytophysiology of hair sensitive cells.

Topic 24. Cardiovascular system. Heart. Arteries. Veins. Microcirculatory bed. Heart. Embryogenesis. The general structure of the wall of heart. Endocardium, myocardium, epicardium. The contractile apparatus of the heart. Cardiac muscle tissue: fibers, cardiomyocytes, contraction characteristics. Conductive system of the heart: features of the structure and functioning of contracting and conductive cardiomyocytes. Fibrous skeleton of the heart. Endocardium. Heart valves. Secretory cardiomyocytes: localization, structure and functions. Blood vessels. Classification. General plan of structure: layers, tissue composition Dependence of the structure of the vessel wall on the conditions of hemodynamics. Arteries. General plan of the structure. Classification. Structural bases of classification of arteries (elastic, muscular-elastic, muscular). Features of layers structure, trophic, innervation, histophysiology.

Topic 25. Cardiovascular system. Veins. Microcirculatory bed. Microcirculatory bed. Arterioles, capillaries, venules. Arteriolo-venular anastomoses. Structure, functional significance. Neurohumoral, endothelium-dependent and local mechanisms of regulation in the microcirculation. Veins, features of a structure according to hemodynamic conditions. Classification of veins. The structure of venous valves. Organ and age features of venous histophysiology. Lymphatic vessels. Classification of lymphatic vessels of different types. Lymphatic capillaries: features of structure, mechanisms of formation and composition of lymph.

Topic 26. Central organs of hematopoiesis and immune defense. Red bone marrow. Thymus. General morphofunctional characteristics and classification of hematopoietic organs and immunogenesis. Immune defense system. Nonspecific and specific immunity. Antigen-presenting cells: structure, markers, functional significance. Types of lymphocytes. Classification of T- and B-lymphocytes, functional significance. Red bone marrow. Localization, structure and functions, tissue composition, cytoarchitectonics, vascularization. Proliferation and differentiation of hematopoietic cells. Yellow bone marrow. Age changes. Thymus as the central organ of T-lymphocytopoiesis. Localization, structure, tissue composition, functions. Lymphocytopoiesis in the thymus. Positive and negative selection of lymphocytes. The body of the thymus (Gassal). Age and accidental involution.

Topic 27. Peripheral organs of hematopoiesis and immune defence. Spleen. Limphatic nodes. Spleen: localization, structure and function. Vascular system and features of blood supply of a spleen. Spleen parenchyma: tissue and structural composition, white and red.

Lymph nodes: localization, structure and function. Functional areas of lymph nodes. Histophysiology of lymph nodes. Lymphoid tissue of mucous membranes and skin. Cellular bases of immune reactions.

Topic 28. Control of practical skills (diagnosis of slides) according to topics 20-27.

Demonstration by a student of mastering practical skills. Ability to adjust the microscope to work, use low and high magnification lenses, identify the micropreparation by its structural features and tinctorial properties, identify and indicate a certain structure in the specimen. Motivate your answer. To determine ultramicroscopic structures on EM-microphotography, to analyze their functional state according to the features of the structure.

Topic 29. Control of assignment of theoretical knowledge according to topics 20-28. Demonstration by the student of the assimilation of the KROK 1 tests and theoretical knowledge on topics 20 – 28 with the subsequent analysis of mistakes.

Topic 30. Endocrine system. Hypothalamus. Pituitary gland. Epiphysis. The concept of the chemical nature of hormones and their significance for the body. Classification of structures of the endocrine system. Hierarchical organization and the principle of feedback. Central part of the endocrine system: hypothalamus, pituitary gland, pineal gland. Sources of development. General characteristics, structure, hormones, their targets and biological effects. Age changes. Neuroendocrine system of regulation of body functions.

Topic 31. Endocrine system. Thyroid, parathyroid and adrenal glands. Adrenal glands: localization, general plan of structure, functions. The cortex of the adrenal gland. Development. Morphofunctional characteristics: zones, structure, types of endocrinocytes, regulation of their secretory activity. Hormones of the cortex and medulla of the adrenal gland: regulation of the secretory activity of endocrinocytes in different areas, their targets and biological effects. Hypothalamic-pituitary-adrenocortical system: principles of regulation, biological role. Thyroid gland. Development. general plan of structure, tissue composition. Hypothalamic-pituitary-thyroid system. Thyroid glands. Development, structure and cell composition. Principles of regulation of calcium metabolism: thyroid and parathyroid hormones. Diffuse endocrine system: localization, cells, their hormones and biological role. Neuroendocrine cells of the ARUD system, localization, hormones and their action.

Topic 32. Urinary system. General morphofunctional characteristics. Kidneys. Sources and course of development. General structure: cortex and medullr. Kidney lobes and lobules. Features of renal blood circulation - cortex and medullary blood supply systems. Nephron as a structural and functional unit of the kidney. Types of nephrons. Departments of the nephron, structure and functional significance. Filtration barrier. Structural and molecular bases of tubular reabsorption and secretion, regulation. Stages and mechanisms of urine formation, their structural support and regulation. Endocrine apparatus of the kidney. The juxtaglomerular complex, its structure and functions. Prostaglandin apparatus of the kidney. Interstitial cells: structure, prostaglandins, their targets and functional significance. Regenerative potencies of the kidney. Urinary tract: parts, structure and functions. Features of histophysiology of renal cups, pelvis, ureters, urinary bladder, urethra. Age changes.

Topic 33. Male reproductive system. Spermatogenesis. Testicles. Additional glands of male reproductive system. General characteristics. Sources and course of development. Functions. Principles of regulation. Communication with the hypothalamic-pituitary system. Testicles: location, structure and functions. Hematotesticular barrier. Spermatogenesis: cycle and wave of spermatogenesis. Stages of spermatogenesis, occurring processes and their biological meaning. Conditions and regulation of spermatogenesis. Testicular histophysiology at different ages: childhood, puberty, adult, aging. Seminiferous pathways: intratesticular and extratesticular tubules and ducts, general structure. Additional glands. General structure, functional significance. Sperm (ejaculate): the composition of sperm. Spermogram. Structural and chemical composition, diagnostic value. External genitalia. Penis (rod), its structure, vascularization and innervation. Cavernous and spongy bodies: translations and caves. Vascular system, its regulation.

Topic 34. Female reproductive system. Ovaries. Ovogenesis. Ovary: sources and course of development, general plan of structure, functions. Tunica albuginea of the ovary, parenchyma. Cortex: follicles, features of the stroma. Medulla: gate cells, their structure and functional significance. Foliculogenesis. Ovulation: mechanisms, regulation, biological significance. Follicle atresia. Corpus luteum: phases of development (luteogenesis). Ovarian hormones: targets and biological effects. Ovogenesis: phases, their essence, spatial and chronological characteristics, morphological manifestations, connection with folliculogenesis.
Histophysiology of the ovary at different ages.

Topic 35. Female reproductive system. Ovarian-menstrual cycle. Uterus. Vagina. Uterine tubes. Menstrual cycle and its phases, connection with the hypothalamic-pituitary-ovarian system of regulation. Morphogenesis of the endometrium in different phases of the cycle, regulation, biological significance. Internal genital organs: sources and course of

development, general plan of structure, layers, tissue composition, functional significance. Uterine tubes: parts, structure and functions, features of the cellular composition of the integumentary epithelium. Structural bases of gamete and zygote transport. Uterus. The structure of the wall (endometrium, myometrium, perimetrium). Uterine glands: parts, their functional significance. Menstrual cycle and its phases, connection with the hypothalamic-pituitary-ovarian system of regulation. Morphogenesis of the endometrium in different phases of the cycle, regulation, biological significance. Myometrium: layers, tissue composition, functions.
Changes in the structure of the uterus (endometrium and myometrium) during pregnancy.
Cervix: departments, structure of the mucous membrane, cervical gland, regulation, characteristics of the secretion, cytological examination of smears-imprints of the cervical epithelium: criteria, diagnostic value. Histophysiology of the uterus at different ages.
Vagina: sources of development, wall structure, changes in the epithelium of the mucous membrane in different phases of the menstrual cycle.

Topic 36. Medical embryology. Early stages of human development. Provisoral organs. Critical periods of human development. Periods of embryogenesis: general characteristics, duration, localization. Critical periods of development. Progenesis: key elements, possibilities and mechanisms of fertilization. Fertilization phases. Zygote formation: processing of female and male nuclei, replication, preparation for the first division of fragmentation. The concept of in vitro fertilization and cloning. Crushing: localization, characteristics, conditions of embryo transport. Blastomers: characteristics, types, features of the cell cycle. Blastocyst formation. Implantation: localization, conditions, characteristics, phases.

Gastrulation: essence, morphogenetic components, phases, terms. Early gastrulation: delamination, hypoblast and epiblast formation, cell migration. Formation of amnion, yolk sac, chorion, allantois: wall structure, functional significance. Diagnosis of pregnancy: terms and markers. Late gastrulation: terms, stages. Formation of embryonic leaves and note chords. Embryonic induction: molecular genetic determinants, role in histo- and organogenesis. Neurulation and morphogenesis of the nervous system: timing, sequence, genetic determinants, molecular mechanisms, possible developmental abnormalities. Somite period. Formation of the celom. Nutrition of embrion. Chorionic villi. Placentation: timing, morphogenesis, regulation, functional significance. Placenta: parts, structure, functional significance. Provisional human organs: chorion, amnion, yolk sac, allantois, umbilical cord. The concept of critical periods of embryogenesis and ontogenesis. Restructuring of the female reproductive system during pregnancy. Mammary gland.

Topic 37. Control of practical skills (diagnostics of slides) on topics 30-36.
Demonstration by the student mastering practical skills. Ability to adjust the microscope to work, use small and large zoom lenses. Ability to identify slide by structural features and tinctorial properties. The ability to identify and indicate a specific structure in the drug. To motivate your answer. To determine ultramicroscopic structures on EM-micrographs, to analyze their functional state according to the peculiarities of structure.

Topic 38. Control of theoretical knowledge on topics 30 - 37. Demonstration by the student of mastering theoretical knowledge and tests of the KROK 1 format on topics 35 - 43 with subsequent analysis of mistakes.

Topic 39. Oral cavity. Salivary glands. General morphofunctional characteristics. Sources of development. Division into departments by parts, structures and functions. General plan of the structure of the wall of the digestive tract. Layers: tissue composition, functional significance. Digestive glands, their location, structure and functions. The concept of gastrointestinal-pancreatic endocrine system, its significance for the body. Oral cavity. Sources and course of development of the oral cavity and face. Features of the structure of the oral mucosa. Functional types of oral mucosa. Lining, masticatory, specialized types of mucous membrane: localization, features of structure and function. Organ of taste: parts, structural composition, structure. The organ of taste. General characteristics: sources of development, localization, functional significance. Taste buds: structure. Cell composition. Histophysiology of

the taste organ. Age-related changes. General morphofunctional characteristics. Structure of exocrine and endocrine parts. Large and small salivary glands. Structural and functional characteristics. Types of secretory portion: structure, secretory activity, regulation of secretory activity. External duct system. Regeneration. Mechanisms of saliva formation: primary and secondary saliva. Chemical composition and role of saliva in maintaining oral homeostasis.

Topic 40. General characteristics of the teeth structure. Teeth. General Information. General plan of structural organization of teeth. Tooth tissues, their distribution on anatomical parts. General characteristics and function of enamel. The structure of the enamel. Enamel prisms. Inter-objective substance, non-objective enamel. Gunter-Schroeger bands. Retzius lines. Enamel plates, bundles and spindles. Surface enamel formations. Cuticle, pelicula. Age-related changes in enamel. General characteristics and functions of dentin. The structure of dentin. Intercellular substance and dentinal tubules. Peritubular and intertubular dentin. Interglobular dentin. Dentin and pulp sensitivity. Denticles. Primary, secondary and tertiary dentin. Sclerosed (transparent) dentin and dead pathways in dentin. General characteristics and functions of cement. The structure of cement. Cellular and cell-free cement. The involvement of cement in the formation of the supporting apparatus of the tooth, reparative processes and its compensatory deposition. Hypercementosis and cementitious.

Topic 41. Alimantary canal. Pharynx. Esophagus. Stomach. Pharynx (throat): parts, features of the structure of the pharynx wall. Lymphoepithelial pharyngeal ring. Tonsils: general structure, functional significance. Features of the structure of different tonsils. Esophagus. Sources of development, layers, tissue composition. Esophageal glands, localization, histophysiology. Features of the structure of the esophageal wall in different parts. Age-related changes. Stomach. Sources and course of development. Departments. The structure of the wall, layers, their tissue composition, relief, functions.

Topic 42. Alimentary canal. Small and Large Intestine. Small intestine. General characteristics of different anatomical parts, wall structure. Features of the relief of the mucous membrane. Crypt-villi system. Histophysiology of intestinal digestion: phases, chemical and structural support. Features of the structure of the duodenum, jejunum and ileum. Intestinal-associated lymphoid tissue: localization, structural organization, functional significance. Age-related changes in the small intestine. Colon. Sources and course of development, the role of nerve crest cells. Wall structure: layers, tissue composition, relief. Crypts: cell composition, structural and functional characteristics of different cells. Endocrine cells of the colon: types, localization. Structure, hormones, their targets and biological effects. Histophysiology of the colon. The appendix, its structure, function. Rectum, departments, their morphofunctional features. Age-related changes.

Topic 43. Digestive glands. Liver. Pancreas. Liver. Sources and course of development. General characteristics: parts, tissue composition, functions. Hepatic lobe, hepatic acinus, portal lobe: connection with the peculiarities of blood supply and localization of stem cells. The structure of the classical lobe of the liver: zones, their functional characteristics. Hepatic lameles. Hepatocytes: structural and functional types, their structure, functional zones and surfaces of the hepatocyte, bile ducts. Sinusoids. Around the sinusoidal space (Disse): cell composition, features of the chemical composition of the matrix. Biliary tract: composition, general plan of the structure. Gallbladder: features of the structure of the mucous membrane. Cellular composition of the outer epithelium. Regulation of bile transport. Liver regeneration and age-related changes. Pancreas. Sources and course of development, anatomical and functional connection with the digestive tract.

Topic 44. Respiratory system. General morphofunctional characteristics. Airways and respiratory ways. Airways apparatus: basics of regulation of external respiration. Airways: departments, sources and course of development. general plan of structure, functions. Airway wall membranes: tissue composition, functional significance. Muco-ciliary apparatus: composition, regulation, role in air conditioning. Airway endocrinocytes. Regional features of the structure of the airway wall. Lungs. Sources and course of development. General plan of the

structure of the lungs. Acinus as a structural and functional unit of the respiratory lung. Alveoli: structure, cell composition, intercellular septa. Surfactant complex. Air-blood barrier. Pleura: leaves, layers, tissue composition, functional significance. Age-related changes.

Topic 45. Skin and its derivatives. Skin and its derivatives. General morphofunctional characteristics. Sources of development, layers, tissue composition, functions. Regeneration. Structural and functional types and areas of skin. Epidermis: layers, features of structure, cellular structure of epidermis. Derma. Papillary and reticular layers. Dermo-epidermal connection. Glands of the skin. Hair: Development, structure, growth, hair change, hair follicle cycle. Nails: Development, structure, growth.

Topic 46. Control of practical skills (diagnostics slides) on topics 39 - 45. Demonstration by a student of mastering practical skills. Ability to identify the micropreparation by its structural features and tinctorial properties. Ability to identify and indicate a certain structure in the drug. Motivate your answer. To determine ultramicroscopic structures on EM-microphotography, to analyze their functional state according to the peculiarities of the structure.

Topic 47. Control of theoretical knowledge on topics 39 - 46. Demonstration by the students mastering of the theoretical knowledge and tests of the KROK 1 format on topics 39 - 46 with the subsequent analysis of mistakes.

. Final control of knowledge of the KROK 1 format tests on the course of histology, cytology and embryology.

4.Structure of subgect

Topic	Number of hours			
	Total	Including		
		L.	P.c	IWT
Section 1. General Histology.				
Topic 1. Introduction to the course of histology, cytology and embryology. Microscopic. Microscope devices. Histological technique.	6	2	2	2
Topic 2. Cytology. General organization of the cell. Plasmolema. Cell-to-cell junctions. Cytoplasm. Cell metabolism. Synthetic cell apparatus. Catabolism system.	14	0	2	12
Topic 3. Cytology. Cytoplasm. Cytoskeleton. Cytoprotection system and cell self-renewal. Nucleus. Reproduction of cells. Cell cycle. Mitosis. Cell life cycle. Differentiation. Aging. Cell death.	14	0	2	12
Topic 4. The concept of tissue. Epithelial tissue. Types of simple epithelia.	9	1	2	7
Topic 5. Stratified and glandular epithelia.	9	1	2	7
Topic 6. Tissues of the internal environment. Blood. Erythrocytes. Trombocytes. Plasma.	7	1	2	5
Topic 7. Blood. Granular leukocytes. Agranular leukocytes. Lymph. Clinical significance of blood indicators. Embryonic and postembryonic hemocytopoiesis.	7	1	2	5
Topic 8. Control of practical skills (diagnosis of slides) according to topics 1-7.	6	0	2	4
Topic 9. Control of assignment theoretical knowledge according to topics 1-8.	2	0	2	0
Topic 10. Connective tissue. Cells of loose connective tissue.	6	1	2	3
Topic 11. Dense connective tissue. Connective tissue with special	6	1	2	3

properties.				
Topic 12. Cartilage. Chondrohistogenesis.	7	1	2	4
Topic 13. Skeletal tissues. Structure of bone tissue. Bone joints. Osteogistogenesis.	7	1	2	4
Topic 14. Muscular tissue. Striated skeletal muscle tissue. Cardiac and Smooth muscle tissue.	5	1	2	2
Topic 15.. Cardiac and Smooth muscle tissue.	4	0	2	2
Topic 16. Nervous tissue. Neurocytes. Neuroglia. Nervous fibers	6	1	2	3
Topic 17. Nervous fibers and endings.	4	0	2	2
Topic 18. Control of practical skills according to topics 10-17.	9	0	2	7
Topic 19. Control of assignment of theoretical knowledge according to topics 10-18.	2	0	2	0
Total :	134	12	38	84
Section 2. Special Histology.				
Topic 20. Nervous system. Cerebral cortex.	4	1	2	1
Topic 21. Nervous system. Spinal and vegetative ganglia. Spinal cord. Peripheral nerves. Nervous system.	3	0	2	1
Topic 22. Sensory systems. Organ of vision.	5	1	2	2
Topic 23. Sensory systems. Organ of hearing and equilibrium.	4	0	2	2
Topic 24. Cardiovascular system. Heart. Arteries. Cardiovascular system. Veins. Microcirculatory bed.	4	1	2	1
Topic 25. Cardiovascular system. Veins. Microcirculatory bed.	4	1	2	1
Topic 26. Central organs of hematopoiesis and immune defense. Red bone marrow. Thymus.	5	1	2	3
Topic 27. Peripheral organs of hematopoiesis and immune defence. Spleen. Limphatic nodes.	5	1	2	2
Topic 28. Control of practical skills according to topics 20-27.	2	0	2	0
Topic 29. Control of assignment of theoretical knowledge according to topics 20-28.	2	0	2	0
Topic 30. Endocrine system. Hypothalamus. Pituitary gland. Epiphysis.	5	1	2	2
Topic 31. Endocrine system. Thyroid, parathyroid and adrenal glands.	6	1	2	3
Topic 32. Urinary system.	6	2	2	2
Topic 33. Male reproductive system. Spermatogenesis. Testicles. Additional glands of male reproductive system.	7	1	2	4
Topic 34. Female reproductive system. Ovaries. Ovogenesis.	7	1	2	4
Topic 35. Female reproductive system. Ovarian-menstrual cycle. Uterus. Vagina. Uterine tubes.	7	0	2	5

Topic 36. Medical embryology. Early stages of human development. Provisoral organs. Medical embryology. Provisoral organs. Critical periods of human development.	6	2	2	2
Topic 37. Control of practical skills on topics 24-30.	4	0	2	2
Topic 38. Control of theoretical knowledge on topics 24 - 31.	2	0	2	0
Topic 39. Oral cavity. Salivary glands.	5	1	2	2
Topic 40. General characteristics of the structure of the teeth.	4	0	2	2
Topic 41. Alimantary canal. Pharynx. Esophagus. Stomach.	5	1	2	3
Topic 42. Alimentary canal. Small and Large Intestine.	5	0	2	3
Topic 43. Digestive glands. Liver. Pancreas.	5	1	2	2
Topic 44. Respiratory system.	5	1	2	2
Topic 45. Skin and its derivatives.	4	0	2	2
Topic 46. Control of practical skills on topics 39 - 45.	4	0	2	2
Topic 47. Control of theoretical knowledge on topics 39 - 46.	2	0	2	0
Total with section 2. Special Histology.	127	18	56	53
Final control of knowledge of the KROK 1 format tests on the course of histology, cytology and embryology.	9	0	2	7
Total hours per year:	**270**	**30**	**96**	**144**

5. Topics of lecture and practical classes

5.1. Topics of lecture classes

№	Topic	Number of hours
1.	Introduction to the course of histology, cytology and embryology. Structural and molecular bases of cell functioning.	2
2.	The concept of tissue. Epithelial tissue.	2
3.	Blood and lymph. Hematopoiesis.	2
4.	Connective tissue.	2
5	Cartilage and bone tissue	2
6.	Muscle tissue. Nerve tissue.	2
7.	Nervous System. Organs of sense.	2
8.	Cardiovascular system.	2
9.	Hemopoetic organs and immune defense.	2
10.	Endocrine system.	2
11.	Urinary system.	2
12.	Male reproductive system. Female reproductive system.	2
13.	Medical embryology.	2
14.	The digestive tube.	2
15.	Digestive glands. Respiratory system.	2

	Total hours	30

5.2. Topics of seminar classes
Seminar classes are not provided.

5.3. Topics of practical classes

№	Topic	Number of hours
1.	Topic 1. Introduction to the course of histology, cytology and embryology. Microscopic. Microscope devices. Histological technique.	2
2.	Topic 2. Cytology. General organization of the cell. Plasmolema. Cell-to-cell junctions. Cytoplasm. Cell metabolism. Synthetic cell apparatus. Catabolism system.	2
3.	Topic 3. Cytology. Cytoplasm. Cytoskeleton. Cytoprotection system and cell self-renewal. Nucleus. Reproduction of cells. Cell cycle. Mitosis. Cell life cycle. Differentiation. Aging. Cell death.	2
4.	Topic 4. The concept of tissue. Epithelial tissue. Types of simple epithelia.	2
5.	Topic 5. Stratified and glandular epithelia.	2
6.	Topic 6. Tissues of the internal environment. Blood. Erythrocytes. Trombocytes. Plasma.	2
7.	Topic 7. Blood. Granular leukocytes. Agranular leukocytes. Lymph. Clinical significance of blood indicators. Embryonic and postembryonic hemocytopoiesis.	2
8.	Topic 8. Control of practical skills (diagnosis of slides) according to topics 1-7.	2
9.	Topic 9. Control of assignment theoretical knowledge according to topics 1-8.	2
10.	Topic 10. Connective tissue. Cells of loose connective tissue.	2
11.	Topic 11. Dense connective tissue. Connective tissue with special properties.	2
12.	Topic 12. Cartilage. Chondrohistogenesis.	2
13.	Topic 13. Skeletal tissues. Structure of bone tissue. Bone joints. Osteogistogenesis.	2
14.	Topic 14. Muscular tissue. Striated skeletal muscle tissue. Cardiac and Smooth muscle tissue.	2
15.	Topic 15.. Cardiac and Smooth muscle tissue.	2
16.	Topic 16. Nervous tissue. Neurocytes. Neuroglia. Nervous fibers	2
17.	Topic 17. Nervous fibers and endings.	2
18.	Topic 18. Control of practical skills according to topics 10-17.	2
19.	Topic 19. Control of assignment of theoretical knowledge according to topics 10-18.	2
20.	Topic 20. Nervous system. Cerebral cortex.	2
21.	Topic 21. Nervous system. Spinal and vegetative ganglia. Spinal cord.	2

	Peripheral nerves. Nervous system.	
22.	Topic 22. Sensory systems. Organ of vision.	2
23.	Topic 23. Sensory systems. Organ of hearing and equilibrium.	2
24.	Topic 24. Cardiovascular system. Heart. Arteries. Cardiovascular system. Veins. Microcirculatory bed.	2
25.	Topic 25. Cardiovascular system. Veins. Microcirculatory bed.	2
26.	Topic 26. Central organs of hematopoiesis and immune defense. Red bone marrow. Thymus.	2
27.	Topic 27. Peripheral organs of hematopoiesis and immune defence. Spleen. Limphatic nodes.	2
28.	Topic 28. Control of practical skills according to topics 20-27.	2
29.	Topic 29. Control of assignment of theoretical knowledge according to topics 20-28.	2
30.	Topic 30. Endocrine system. Hypothalamus. Pituitary gland. Epiphysis.	2
31.	Topic 31. Endocrine system. Thyroid, parathyroid and adrenal glands.	2
32.	Topic 32. Urinary system.	2
33.	Topic 33. Male reproductive system. Spermatogenesis. Testicles. Additional glands of male reproductive system.	2
34.	Topic 34. Female reproductive system. Ovaries. Ovogenesis.	2
35.	Topic 35. Female reproductive system. Ovarian-menstrual cycle. Uterus. Vagina. Uterine tubes.	2
36.	Topic 36. Medical embryology. Early stages of human development. Provisoral organs. Medical embryology. Provisoral organs. Critical periods of human development.	2
37.	Topic 37. Control of practical skills on topics 24-30.	2
38.	Topic 38. Control of theoretical knowledge on topics 24 - 31.	2
39.	Topic 39. Oral cavity. Salivary glands.	2
40.	Topic 40. General characteristics of the structure of the teeth.	2
41.	Topic 41. Alimantary canal. Pharynx. Esophagus. Stomach.	2
42.	Topic 42. Alimentary canal. Small and Large Intestine.	2
43.	Topic 43. Digestive glands. Liver. Pancreas.	2
44.	Topic 44. Respiratory system.	2
45.	Topic 45. Skin and its derivatives.	2
46.	Topic 46. Control of practical skills on topics 39 - 45.	2
47.	Topic 47. Control of theoretical knowledge on topics 39 - 46.	2
48	Topic 48. Final control of knowledge of the KROK 1 format tests on the course of histology, cytology and embryology.	2
	Total hours:	96

6. Independent student work

	Types IWT	**Number of hours**
1	Microscopic instruments. Phase - contrast, dark field, interference microscopy. Histological technique. Basic principles of preparation of preparations for electron microscopy. Quantitative research methods.	2

2	Cytology. General organization of cells.	2
3	Working with slides	3
4	The concept of tissue. Patterns of tissue origin and evolution, theory of parallelism and divergent evolution.	2
5	Blood and lymph. Age-related changes in blood composition. Theories of hematopoiesis. A hematopoietic stem cell. Mono- and lymphopoiesis. The concept of blasttransformation. Lymph.	2
6	Connective tissues. The connective tissue system as the internal environment of the body. The concept of the macrophage system of the body.	6
7	Cartilage and bone tissue. Bone remodeling as the body grows. Factors affecting bone growth. Connection of bones. Classification. Structure of joints, articular cartilage, articular capsule, its structure.	4
8	Muscle tissue. Red and white muscle fibers. Muscle structure as an organ. Regeneration of different types of muscle tissue.	2
9	Nerve tissue. Processes of transport of substances in a neuron. The concept of neurotransmitters. Secretory neurons. De- and regeneration of nerve fibers. Morphological substrate of the reflex activity of the nervous system (the concept of simple and complex reflex arcs). Neural theory.	4
10	Central nervous system. Nerve centers. The most important associative nuclei. Hematoencephalic barrier, structure, value. Features of reaction of nerve trunks to damage, recovery processes. General morphofunctional characteristics of the autonomic nervous system. The nuclei of the central parts of the autonomic nervous system. The structure of the ganglia of the autonomic nervous system. Prenodal and postnodal nerve fibers.	2
11	Sensory organs Classification of sensory organs by origin and structure of receptor cells. Optic nerve. Hematoophthalmic barrier. Auxiliary apparatus of the eye. Age changes. The olfactory organ. Vomero-nasal organ. The organ of taste.	4
12	Endocrine system. The concept of hormones and their meaning for the body. Whole cells and hormone receptors. The mechanism of action of hormones. The principle of feedback. Role of adrenal cortex hormones in the development of general adaptation syndrome. Single hormone-producing cells of nonendocrine organs. APUD cells - systems, localization, hormones and their action.	2
13	Cardiovascular system. Lymphatic vessels. Classification, structure of lymphatic vessels of different types. Features of structure of lymphatic capillaries and postcapillaries, participation in microcirculation.	2
14	Organs of hematopoiesis and immune protection. Interaction of stromal and hematopoietic elements. Thymic-lymphatic status. Hemolymph nodes. The only immune system is the mucous membranes of the organs.	4
15	The digestive system. General morphofunctional characteristics. Division into development, structure and function departments. Organs of the oral cavity. Features of structures of mucous membrane of different parts of the mouth. Age changes, regeneration. The Digestive System. Pharynx. innervation and vascularization of the digestive tube. The concept of gastroenteropancreatic endocrine system, its meaning for the body. Age changes, regeneration. The Digestive System. The gallbladder and biliary tract. Regenerative potency of the digestive system. Age changes.	4
16	Working with slides.	4

17	Respiratory system. Histophysiology of the upper respiratory tract: nasal cavity, pharynx, larynx. The concept of broncho-associated lymphoid tissue, its meaning for the body. Pleura.	4
18	Urinary system. Age changes, regenerative potencies of the kidney. Urinary tract, structure of renal bowls, cups, ureter, bladder, urethra. Development of the urogenital system.	2
19	Male reproductive system. Age changes. The penis, its structure, vascularization and innervation.	4
20	Female reproductive system. Remodeling of the uterus during pregnancy and after childbirth. Age changes. Vagina. The structure of the wall, the change of structure in connection with the menstrual cycle. Mammary gland.	2
21	Early human embryogenesis. Stem cells, their use in practical medicine. In vitro fertilization.	4
22	Covering device. Glands of skin, hair, nails.	3
23	Working with slides.	7
	Total hours	144

7. Teaching methods

Practical classes: interviewing students, conversation, solving situational and test tasks of the KROK-1 format, demonstration and practice of skills of work with micropreparations and electrograms, entering results into a practical notebook.

Independent work: independent work with a textbook, methodical manuals, with a bank of theoretical and test tasks Step-1, independent solution of situational and test tasks.

8. Methods of control and criteria for evaluating learning outcomes

Current practical control: assessment of practical skills in working with micropreparations and electrograms.
Current theoretical control: oral examination, testing.
Final control: exam.
The structure of the current assessment in the practical lesson:
1. Assessment of theoretical knowledge on the topic of the lesson:
- methods: surveys, solving situational problems and test tasks;
- maximum mark - 5, minimum mark - 3, unsatisfactory mark - 2.
2. Assessment of practical skills and keeping a practical notebook on the topic of the lesson:
- methods: assessment of the correctness of filling out a practical notebook (tables and pictures)
- maximum mark - 5, minimum mark - 3, unsatisfactory mark - 2;

Criteria for current assessment in the practical lesson:

«5»	The student is fluent in the material, takes an active part in the discussion and solution of situational and test problems, confidently demonstrates practical skills in working with micropreparations, expresses his opinion on the topic of the lesson, demonstrates basic knowledge.
«4»	The student is well versed in the material, participates in the discussion and solution of situational and test problems, demonstrates practical skills in working with micropreparations with some mistakes, expresses his opinion on the topic of the lesson, demonstrates basic knowledge.
«3»	The student does not have enough material, insecurely participates in the discussion and

	solution of situational and test tasks, demonstrates practical skills when working with micropreparations and electrograms.
«2»	The student does not own the material, does not participate in the discussion and solution of situational and test tasks, does not demonstrate practical skills when working with micropreparations and electrograms.

The student is admitted to the exam if he meets the requirements of the curriculum and if for the current academic activity he received at least 3.00 points and passed the final test control for the tests "KROK-1" by at least 90%. Test control is carried out in the Training and Production Complex of Innovative Technologies of Teaching, Informatization and Continuing Education of ONMedU at the last lesson.

Criteria for assessing the learning outcomes of students in the exam:

«5»	Exhibited to a student who worked systematically during the semester, showed during the exam versatile and deep knowledge of the program material, is able to successfully perform the tasks provided by the program, mastered the content of basic and additional literature, realized the relationship of individual sections of the suubject, their importance for future profession, showed creative abilities in understanding and using educational material, showed the ability to independently update and replenish knowledge; level of competence - high (creative);
«4»	It is presented to a student who has shown full knowledge of the curriculum, successfully performs the tasks provided by the program, mastered the basic literature recommended by the program, showed a sufficient level of knowledge of the subject and is able to independently update and update during further study and professional activities; level of competence - sufficient (constructive-variable)
«3»	Exhibited to a student who has shown knowledge of the basic curriculum in the amount necessary for further study and further work in the profession, copes with the tasks provided by the program, made some mistakes in answering the exam and when performing exam tasks, but has the necessary knowledge to overcoming mistakes under the guidance of a research and teaching staff; level of competence - average (reproductive)
«2»	Exposed to a student who did not show sufficient knowledge of the basic curriculum, made fundamental mistakes in performing the tasks provided by the program, can not without the help of the teacher to use the knowledge in further study, failed to master the skills of independent work; level of competence - low (receptive-productive).

9. Distribution of points received by applicants for higher education

The grade for the subject consists of 50.0% of the grade for the current performance and 50.0% of the mark for the exam.

The average score for the subject is translated into a national grade and converted into scores on a multi-point scale.

Conversion of the traditional grade for the discipline in the 200-point is carried out by the information and computer center of the university program "Contingent".

Table for conversion of traditional assessment into multi-point:

National grade on a discipline	The sum of points for the discipline

«5»	**185-200**
«4»	**151-184**
«3»	**120-150**
«2»	**Below 120**

Points from the discipline are independently converted into both the ECTS scale and the four-point scale. ECTS scale scores are not converted to a four-point scale and vice versa. Further accounts are carried out by the information and computer center of the university.

Conversion of traditional assessment in the discipline and the amount of points on the ECTS scale

ECTS score	Statistical indicator
A	The best 10% of students
B	The next 25% of students
C	The next 30% of students
D	The next 25% of students
E	The next 10% of students

10. Methodical support:

- Working program of the discipline
- The syllabus of the discipline
- Textbooks, manuals
- Multimedia presentations
- Methodical development of practical classes
- Electronic bank of test tasks by divisions of the discipline.

11. List of questions for the exam

Section 1 "General Histology"

1. Histology. Definition and significance for biology and medicine. Methods of histological research. Basic principles and stages of preparation of histological preparations.

2. Cytology. Definition, meaning for biology and medicine. Morphofunctional characteristics of the main cell structures (plasmolemma, cytoplasm, organelles, inclusions)

3. Intercellular contacts, their types, structure and functions.

4. The nuclear apparatus of the cell, its meaning. The main components of the core, their structural and functional characteristics. Nuclear-cytoplasmic relationship.

5. Cell cycle: its stages, morphological and functional characteristics. Methods of reproduction of cells , their morphological characteristics. Mitosis , significance, characteristics of phases and regulation. The concept of endoreproduction and polyploidy. Meiosis, meaning. Difference from mitosis.

6.Tissues. Definition of the concept. Classification. Concept of tissue determination and differentiation. Patterns of development. Physiological and reparative regeneration of various types of tissues. Epithelial tissues. General characteristics. Morphofunctional and phylogenetic classification of their types and characteristics of different types of covering epithelium. Glandular epithelium. Classification and structure of glands. Morphology of the secretory cycle. Types of secretion.

7. Tissues of the internal environment. Classification, sources of development, general morphofunctional characteristics. Characteristics of blood as a tissue. Formed elements of blood. Erythrocytes, structure and functional significance. Platelets, their number, function, duration of existence. Hemogram.

8. Leukocytes. Classification, morphofunctional characteristics. Leukocyte formula and its features at different stages of ontogenesis. Granulocytes (neutrophils, eosinophils and basophils) structure and functions. Morphofunctional characteristics of agranulocytes (lymphocytes, monocytes). Leukocyte formula.

9. Embryonic hemocytopoiesis. Development of blood as a tissue. Localization, terms, features of hematopoiesis. Postembryonic hematopoiesis. Hematopoietic stem cells, structure, markers, properties.

10. General characteristics of connective tissues. Classification.

11 . Fibrous connective tissue. loose fibrous connective tissue: sources of development, localization, morphofunctional characteristics of cells of loose connective tissue .

12 . Intercellular substance. The main amorphous substance: chemical composition, structure and functions.

13. Collagen fibers: chemical composition, structure and functional significance. Stages of formation of collagen fibers. The stage of formation of collagen fibers . Elastic fibers: chemical composition, molecular organization, structure, functional significance. Stages of synthesis and maturation of elastic fibers. Reticular fibers: chemical composition, structure, visualization methods, functional significance.

14 . Dense fibrous connective tissues, their types - formal and informal, localization, structure and functions.

15 . Connective tissues with special properties: classification, localization, structure and functions.

16 . General characteristics of skeletal tissues (sources of development, structure, functions). Classification. Cartilaginous tissues. Structural composition. Histogenesis of cartilage tissue. Morphofunctional characteristics of cells, intercellular substance and different types of cartilage tissue. Appositional and interstitial growth of cartilage. Peculiarities of chondrocyte metabolism.

17. Bone tissue. General plan of structure and function. Classification. Morphofunctional characteristics of bone tissue and intercellular substance. Types of bones. Parts of the tubular bone. Histoarchitectonics in different zones of the tubular bone. Direct and indirect osteogenesis. Stages, regulation. Growth of tubular bones in length. Epiphyseal plate. Growth regulators and mechanisms.

18. General characteristics of muscle tissues , properties, classification. Muscle fiber as a structural and functional unit of skeletal muscle tissue . X characteristics of reduction. Regeneration of skeletal muscle tissue.

1 9 . Cardiac muscle tissue. Source of development, structure, characteristics of reduction. Cardiac muscle fibers. Types of cardiomyocytes.

20 . Smooth muscle tissue . _ Histogenesis, morphofunctional characteristics of smooth myocyte contraction. Reduction mechanism. Regeneration of smooth muscle tissue .

21 . Myoid and myoepithelial cells. Sources of development, structural features, functional significance.

22 . Nervous tissue: sources of development, structure, functional properties and significance of neurocytes . Morphological and functional classification of neurons . Neurosecretory cells.

23 . Neuroglia. Classification, sources of development, structure. functional significance of neuroglia cells .

24 . Nerve fibers. General characteristics, classification, pulse conduction characteristics. Myelinated and unmyelinated nerve fibers. Structural and molecular basis of impulse conduction. Regeneration of nerve fibers.

25 . Nerve endings. Receptor (afferent) nerve endings. Classification. structure, localization, relationships with other tissues, functional significance.

26 . Efferent nerve endings. Target cells. Neuromuscular synapses: structure, functional significance, regulation mechanisms.

27 . Interneuronal synapses (classification, structure, mediators). The mechanism of transmission of excitation in synapses.

Section 2 "Special histology"

1. General morphofunctional characteristics of the nervous system. Patterns of development. Classification. Central nervous system. Gray and white matter. Nerve centers: types, cytoarchitectonics. Meninges: tissue composition, structural features, functions. Histogematic barriers of the brain.

2. Brain. General characteristics: development, structure, functions. Departments Big brain. Cerebral cortex: gyri, furrows, functional fields, morphological types of neurons. Neuroglia of the cortex. Histophysiology of cerebral cortex: layers, cytoarchitectonics, myeloarchitectonics. Morphological types of bark .

3. Cerebellum: localization, structure, functions. Cerebellar cortex: layers, cytoarchitectonics. afferent and efferent fibers. Interneuron connections in the cerebellar cortex.

4. Spinal cord. General morpho-functional characteristics. Gray matter: horns, nuclei, neurons. White matter. Front, side and back cords: structural composition, functional significance. Conductive ways.

5. Peripheral nervous system: ganglia, peripheral nerves, endings. Peripheral nerve: general structure plan, structural composition. Endoneurium, perineurium, epineurium. Hemato-neural barrier.

6. Nerve ganglia: types, general structure plan.

7. Vegetative ganglia. Types, sources of development. Structure: fabric composition.

8. General characteristics of sense organs. Classification of sense organs. Cellular and molecular bases of reception. Visual analyzer: links, their structural components, principles of functioning.

9. Organ of vision. Sources and course of development. Eyeball: general structure plan, shells, their parts, tissue composition and functions. Aqueous moisture: role in the functioning and trophism of eye structures. Filtration of aqueous moisture. Hemato-aqueous barrier. Circulation and reabsorption of aqueous moisture. Iris-corneal angle (angle of the anterior chamber of the eye). Trabecular meshwork. Scleral venous sinus (helmet channel).

10. Functional apparatus of the eye. Dioptric apparatus: structural components, general characteristics of light-refracting structures, sources of their trophic.

11. Cornea, layers, trophic, structural and molecular determinants of refraction. Corneal stroma: keratocytes, chemical composition of the intercellular substance. Corneal endothelium: structure, transport mechanisms, role in maintaining corneal hydrophilicity and trophicity.

12. Lens: surfaces, zones, trophic. Lens capsule. Lens epithelium. Morphogenesis of lens fibers, its regulation. Growth and regeneration of the lens.

13. Vitreous body: structure, features of the chemical composition of the matrix, functions, trophic.

14. Accommodation apparatus. Structures. Iris: layers, peculiarities of cellular composition, muscles of the iris, their regulation, role in adaptation to light intensity.

15. Ciliary (ciliary) body: parts, muscles, regulation, ciliary crown, role in changing the shape and refractive power of the lens.

16. Photoreceptor apparatus. Retina. Tissue composition, trophic. Neurons and gliocytes of the retina. Cytoarchitectonics. A yellow spot. Optic nerve. Optic disc (blind spot).

17. Trophic of the retina. The vascular membrane itself: layers, structure. Basal complex. Hematoretinal barrier.

18. Auxiliary apparatus of the eye. Lacrimal glands and lacrimal fluid. Conjunctiva: structure, functional and diagnostic significance. Age changes.

19. Statoacoustic sensor system. Auditory and vestibular analyzer.

20. Ear: sources and course of development. Morphofunction and oral characteristics of the structures of the outer and middle ear .

21. Bony and membranous labyrinth: zones, perilymph. Convolutional (auditory) part of the membranous labyrinth: vestibular membrane, basilar membrane, vascular strip. Endolymph: composition, filtration mechanisms.

22. Spiral organ: cellular composition, tectorial membrane, cytophysiology of the hearing aid.

23. Vestibular part of the membranous labyrinth. Receptor zones of the hair: spot, ampoule combs. Cellular composition of receptor zones: type I and II vestibulocytes (hair sensitive cells), supporting vestibulocytes. Cytophysiology of hair sensitive cells.

24. Olfactory analyzer: parts, structural composition, functional value. The organ of smell. Olfactory epithelium: localization, cellular composition. Olfactory neurosensory cells. Supporting and basal cells. Mechanisms of smell perception. Age changes.

23. Taste analyzer. The organ of taste. General characteristics: sources of development, localization, functional significance. Taste buds: structure. cell structure Taste sensorepithelial cells, supporting and basal cells. Histophysiology of the organ of taste.

24. Morphological bases of skin, deep and visceral sensitivity. Leather and its derivatives. General morphofunctional characteristics. Sources of development, layers, tissue composition, functions. Regeneration. Structural and functional types and zones of the skin. The cellular composition is the dermis in : layers, features of the structure of "thick" and "thin" skin.

25. Derma. Papillary and reticular layers. Features of blood supply and innervation. Skin glands. Sebaceous and sweat glands: localization, structure of end sections, cellular composition, mechanisms of secretion, regulation of the secretory cycle.

26. Hair (hair). Development, structure, growth, hair change, hair follicle cycle: anagen, catagen, telogen - characteristics, regulation. Nails Development, structure, growth. General characteristics. Sources of development. Functional value.

27. Blood vessels. Classification. General plan of the structure of various types of vessels : membranes, tissue composition.

28. Microcirculatory bed. Morphofunctional characteristics of arterioles, capillaries , venules . Arteriolo-venular anastomoses. Histogematic barriers.

2 9. Venules: (classification) types, structure, functional value. Veins, structural features according to hemodynamic conditions. Classification of veins. Structure of venous valves. Organ and age-related features of histophysiology of veins.

30. Lymphatic vessels. Classification of lymphatic vessels of different types. Lymphatic capillaries: structural features, mechanisms of formation and composition of lymph.

31. Heart. Embryogenesis. The general structure of the heart wall. Endocardium, myocardium, epicardium. Contractile apparatus of the heart. Myocardium: features of structure and function. Conductive system of the heart: peculiarities of the structure and functioning of excitatory and conducting cardiomyocytes. Secretory cardiomyocytes. Endocardium. Heart valves.

32. The concept of the chemical nature of hormones and their importance for the body. Target cells. Hormone receptors: types (membrane, nuclear), mechanism of action, biological effects of hormones. Classification of structures of the endocrine system. The central link of the endocrine system. Sources of development. General characteristics.

33. Hypothalamus: departments, nuclei, structural and functional connections with other departments of the nervous system.

34. Neurosecretory cells: structure, markers, cytophysiology. Axovasal synapses.

35. Hypothalamic-pituitary system.

36. Hypophysis. Embryonic development of the adeno- and neurohypophysis. Adenohypophysis: parts, tissue and cellular composition, principles of regulation. The intermediate part of the adenohypophysis: structural features, functional significance. Hypothalamic-adenohypophyseal vascular system, its role in hormone transport. Neurohypophysis: parts, structure, connection with the hypothalamus , functional significance. Blood supply of the hypothalamic-pituitary system.

37. Pineal gland: development, structure, cellular composition, connection with other parts of the nervous system. Pinealocytes: structure, hormones, their targets and biological effects. Age changes.

38. Adrenal glands. Sources and course of development. General structure and functional significance. Cortical substance of the adrenal gland. Morphofunctional characteristics: zones, structure, types of adrenocorticocytes, regulation of their secretory activity. Brain substance of the adrenal gland: structure, cellular composition, hormones, their action.

39. Hypothalamic-pituitary-adrenocortical system: principles of regulation, biological role. Sympatho-adrenal system: composition, principles of functioning, biological significance.

40. Thyroid gland. Development. general structure plan, fabric composition. Follicles: structure, cellular composition. Thyrocytes: structure, secretory cycle, its regulation, hormones, their targets and biological effects. Reconstruction of follicles in connection with different functional activity. Hypothalamic-pituitary-thyroid system. Parafollicular endocrinocytes: sources of development, localization, structure, regulation, hormones, their targets and biological effects.

41. Parathyroid glands. Development, structure and cellular composition. Principles of regulation of calcium metabolism: hormones of the thyroid and parathyroid glands, vitamin D.

47. Single endocrinocytes of non-endocrine organs. Diffuse endocrine system: localization, cells, their hormones and biological role. Neuroendocrine cells of the ARUD system, localization, hormones and their action.

48. General morphofunctional characteristics and classification of organs of hematopoiesis and immunogenesis. Immune protection system. Non-specific and specific immunity. Antigen-presenting cells: structure, markers, functional significance.

49. Red bone marrow. Localization, structure and functions, tissue composition, cytoarchitectonics, vascularization.

50. Thymus as the central organ of T-lymphocytopoiesis. Localization, structure, tissue composition, functions. Thymus lobe: structure, functional zones. Epithelioreticulocytes: types, structure, functional value markers.

51. Lymphocytopoiesis in the thymus. Positive and negative selection of lymphocytes. Age-related and accidental involution of the thymus.

52. Spleen: localization, structure and functions. Stroma of the spleen: tissue composition, role in functioning. Vascular system and features of blood supply to the spleen. Parenchyma of the spleen: tissue and structural composition, white and red pulp. White and red pulp and spleen: zones, cellular composition, functional significance.

53 . Lymph nodes: localization, structure and functions. Functional zones of lymph nodes. System of sinuses. Histophysiology of lymph nodes.

54. General morphofunctional characteristics of the digestive system. Sources of development. Division into departments according to development, structure and functions. General plan of the structure of the wall of the alimentary canal. Shells: tissue composition, functional significance. Mucous membrane - layers, tissues, relief. Innervation and vascularization of the digestive tube.

55. Oral cavity. Sources and course of development of the oral cavity and face. Features of the structure of the mucous membrane of the oral cavity. Functional types of the mucous membrane of the oral cavity.

56. Lips, cheeks, gums, hard and soft palate.

57. Tongue. Sources of development. General plan of the structure. Dorsal and ventral surfaces. Tongue papillae: localization, structure, functional significance.

58. Teeth. Milk and permanent teeth. Odontogenesis. Sources and development of teeth.

59. Tooth tissues. Enamel, dentin, cement - structure, chemical composition, function. Tooth pulp, structure, function. Periodontal disease. Age-related changes in teeth.

60. Pharynx (throat): parts, features of the structure of the pharynx wall.

61. Lympho-epithelial pharyngeal ring. Tonsils general structure, functional meaning. Lympho-epithelial cooperation in the implementation of immunity.

62. Esophagus: sources of development, membranes, tissue composition. Features of the structure of the esophagus wall in different parts.

63. Stomach. Sources and course of development. Departments The structure of walls, shells, their tissue composition, relief, functions. Mucous membrane of the stomach. Epithelium: structure, functions, features of regeneration. Gastric glands: types, morphological type, cellular composition of glands, comparative characteristics. Own glands of the stomach: parts, distribution of cells. Gastric endocrinocytes: localization, types, hormones and their biological effects.

64. Small intestine. General characteristics of various anatomical departments, wall structure. Features of the relief of the mucous membrane. The "crypto-villi" system. Mucous membrane of

the small intestine. Covering epithelium: cellular composition, types of epitheliocytes, their structure and functions. Histophysiology of intestinal digestion: phases, chemical and structural support.

65. Features of the structure of the duodenum, jejunum and ileum. Intestinal-associated lymphoid tissue: localization, structural organization, functional significance.

66. Colon. Sources and course of development. The structure of the wall of the large intestine: shells, tissue composition, relief. Mucous membrane. Relief. Crypts Covering epithelium: cellular composition, structural and functional characteristics of various cells.

67. Vermiform appendix, its structure, function.

68. The rectum, departments, their morphological and functional features. Age changes.

69. Digestive glands: types, connection with different departments of the digestive canal, general plan of structure, functional significance. Large and small salivary glands. Sources and course of development. Pancreas. Sources and course of development. General morphofunctional characteristics. Structure and function of exocrine and endocrine parts.

70. Liver. Sources and course of development. General characteristics: parts, fabric composition, functions. The structure of the classic lobule of the liver: zones, their functional characteristics. Hepatic beams. Hepatocytes: structural and functional types, their structure, functional zones and surfaces of hepatocytes, bile capillaries.

71. Biliary tract: composition, general structure plan.

72. General morphofunctional characteristics of the respiratory system. Airway: departments, sources and course of development. general plan of the structure, functions. Shells of the wall of the airways: tissue composition, functional significance.

7 3. Mucous membrane of the respiratory tube. Covering epithelium: its cellular composition, morphology and cell functions. Muco-ciliary apparatus. Bronchi-associated lymphoid tissue: structural characteristics, functional significance.

74. Regional features of the structure of the wall of the airways. Nasal cavity, larynx, trachea, bronchi (main, large, medium and small diameter), terminal bronchioles, their structure and function.

75. Lungs. Sources and course of development. General plan of the structure of the lung. The concept of a lobe of the lung. Acinus as a structural and functional unit of the respiratory department of the lung. Alveolus: structure, cellular composition, interalveolar partitions. Surfactant complex. Aerogematic barrier.

7 6. Kidneys and urinary organs. General morpho-functional characteristics. Sources of development . General structure: cortex and medulla. Lobes and lobules of the kidney. Nephron as a structural and functional unit of the kidney. Filter barrier. Chemical composition of the ultrafiltrate.

77. Tubular apparatus of the nephron: segments, their location, structure and functional significance. Structural and molecular bases of tubular reabsorption and secretion, regulation. Urine concentration and dilution system. Antiflow-multiplier apparatus: loop of Henle, direct vessels of the brain substance, collecting ducts. Collecting ducts: cellular composition. structural and functional characteristics, regulation.

78. Stages and mechanisms of urine formation, their structural support and regulation. Endocrine apparatus of the kidney. Juxtaglomerular complex, its structure and functions. Prostaglandin apparatus of the kidney. Interstitial cells: structure, prostaglandins, their targets and functional significance.

79. Urinary tract: departments, structure and functions. Peculiarities of histophysiology of kidney cups, bowl, ureters, urinary bladder, urethra.

80 . General characteristics of the male reproductive system. Sources and course of development. Functions. Principles of regulation. Testis (testis): localization, structure and functions. Hematotesticular barrier.

8 1. Spermatogenesis: cycle and wave of spermatogenesis. Stages of spermatogenesis, processes that take place and their biological meaning. Spermatogenic cells: stem cells - spermatogonia, primary and secondary spermatocytes, spermatids, their structure and set of chromosomes. Spermiogenesis: phases. morphological appearances, molecular determinants. Cytophysiology of sperm. Conditions and regulation of spermatogenesis.

82. Seminiferous tracts. Epididymis (appendage of the testicle). Ejaculatory duct. Ejaculatory duct. Male urethra . Additional glands. General structure, functional meaning. Seminal vesicles (follicular gland). Structure, characteristics of the secret, role in the formation of sperm.

83. Prostate gland: zones, groups of glands, characteristics of stroma and parenchyma. Age changes. Gland of the bulb of the urethra (bulb-urethral gland): structure, functional significance.

84. External genitalia. The penis (penis), its structure, vascularization and innervation.

85. General characteristics of the female reproductive system. Sources of development. Functions. Principles of regulation. Ovarian cycle: phases, regulation. Ovarian hormones: targets and biological effects. Cyclical changes in a woman's body.

86. Ovary: sources and course of development, general structure plan, functions. Cortical substance of the ovary: follicles, features of the stroma. Brain substance of the ovary: portal cells, their structure and functional significance.

87. Ovarian follicles: components: primary oocyte, follicular epithelium, transparent membrane, theca. Hematoovarian barrier. Types of ovarian follicles. Folliculogenesis. Ovulation: mechanisms, regulation, biological significance. Atresia of follicles. Yellow body: phases of development (luteogenesis). Ovarian hormones: targets and biological effects.

88. Oogenesis: phases, their essence, spatial-chronological characteristics, morphological manifestations, connection with folliculogenesis.

89. Histophysiology of the ovary in different age periods: before and during puberty, fertile period, during pregnancy and lactation, menopause. Internal genital organs: sources and course of development, general plan of structure, membranes, tissue composition, functional significance.

90. Fallopian tubes: parts, structure and functions, peculiarities of the cellular composition of the covering epithelium, its changes in different phases of the ovarian cycle.

91. Uterus. Wall structure (endometrium, myometrium, perimetrium). Endometrium: layers, tissue composition, features of blood supply of basal and functional layers. Uterine glands: parts, their functional significance. Uterine epithelial stem cells, physiological and reparative regeneration of the endometrium.

92. The menstrual cycle and its phases, connection with the hypothalamic-pituitary-ovarian regulation system.

93. Morphogenesis of the endometrium in different phases of the cycle, regulation, biological significance. Changes in the structure of the uterus (endometrium and myometrium) during pregnancy. Cervix: divisions, structure of the mucous membrane, cervical gland, regulation, characteristics of the secretion, cytological examination of smears-imprints of the epithelium of the cervix: criteria, diagnostic value.

94. Vagina: sources of development, structure of the wall, changes in the epithelium of the mucous membrane in different phases of the menstrual cycle.

95. Mammary gland: sources of development, general structure, functional significance, neuro-endocrine regulation. Mammary gland morphogenesis in different age periods: before and during puberty, during the fertile period, during pregnancy and lactation, post-lactation and age-related involution.

96. Periods of embryogenesis: general characteristics, duration, localization. Critical periods of development of the human organism. Progenesis: key events, possibilities and mechanisms of chromosomal aberrations, factors influencing their frequency.

97. Fertilization: location and conditions of implementation, characteristics of gametes involved in fertilization. Fertilization phases.

98. Cleavage: localization, characteristics, conditions of embryo transport. Blastomeres: characteristics, types, features of the cell cycle. Blastocyst formation: trophoblast, embryoblast (inner cell mass). Implantation: localization, conditions, characteristics, phases. Gastrulation: essence, morphogenetic events, phases, terms.

99. Formation of amnion, yolk sac, chorion, allantois: wall structure, functional significance. Trophics of the embryo. Chorion villi. Placentation: terms, morphogenesis, regulation, functional significance. Placenta: parts, structure, functional significance.

List of histological preparations that must be diagnosed during the exam.

1. Mitosis of plant cells.
2. Golgi complex.
3. Blood of amphibians.
4. Human blood.
5. Adipose tissue.
6. Loose fibrous connective tissue.
7. Tendon.
8. Hyaline cartilage.
9. Elastic cartilage.
10. Fibrous cartilage.
11. A transverse section of the tubular bone.
12. The development of bone at the site of cartilage.
13. Bone development at the site of the mesenchyme.
14. Mesothelium.
15. Cuboid and cylindrical epithelium.
16. Smooth muscle tissue.
17. Streaked heart muscle tissue.
18. Tigroid of nerve cells.
19. Astrocytes.
20. Myelin nerve fibers.
21. Cross section of the nerve trunk.
22. Microvascular bed.
23. The artery is muscle type.
24. Amuscle vein.76. Century.
25. Artery of elastic type.
26. The wall of the heart.eye.
27. Lymph node.
28. The spleen.
29. Palatine tonsil.
30. Red bone marrow.
31. The pituitary gland.
32. The thyroid gland.
33. Thymus.
34. The adrenal gland.
35. Leaf-shaped papillae of the tongue.
36. Fungiform papillae of the tongue.
37. Lip.
38. Longitudinal section of the tooth.
39. A section of a tooth root.
40. Histogenesis of tooth.
41. The esophagus.
42. The transition of the esophagus into the stomach.
43. The bottom of the stomach.
44. The small intestine.
45. The large intestine.
46. The appendix.
47. Parotid salivary gland.
48. Sublingual salivary gland.
49. The liver of a pig.
50. The human liver.
51. Injection of the vessels of the liver.
52. The pancreas
53. The skin of a finger.
54. Skin with hair.
55. Trachea.
56. The lung.
57. The kidney.
58. Ureter.
59. The bladder.
60. Testicle.
61. The epididymis.
62. The prostate gland.
63. Ovary.
64. Fallopian tube.
65. The uterus.
66. The vagina.
67. The mammary gland.
68. The human placenta.
69. The embryo of the vertebrates (96 hours).
70. The umbilical cord.
71. Cortex of the cerebral hemispheres.
72. Cerebellar cortex.
73. Cross section of the spinal cord.
74. Sensitive ganglion.
75. Vegetative ganglion.
76. Eyelid.
77. Meridional section of the anterior part of the eye.
78. Cornea of the eye.
79. Retina of the eye.
80. Spiral (Corti's) organ.

List of electronic microphotographs that must be diagnosed during the exam.

1. Mitochondria
2. Granular endoplasmic reticulum
3. Golgi intracellular mesh apparatus
4. Lysosomes
5. Ciliated epithelial cell
6. Tonofibrils in cells of the prickly layer of the epidermis of the skin
7. Fibroblasts
8. Macrophage
9. Plasma cell
10. Tissue basophil

11. Basophilic granulocyte
12. Eosinophilic granulocyte
13. Neutrophilic granulocyte.
14. Lymphocyte
15. Blood capillary of the fenestrated type
16. Lymphatic capillary
17. Myocardium
18. Intercellular contacts in the prickly layer of the epidermis of the skin
19. Thyrocyte
20. Enamel and dentin at the beginning of the tooth
21. The villi of the small intestine
22. Hepatocyte
23. Pancreatocyte
24. Podocyte and circulatory capillary of the renal calf
25. Epitheliocyte of the proximal nephron
26. Epitheliocyte of the distal nephron
27. Family winding tubule
28. Sperm
29. Secondary follicle
30. Cordless nerve fiber cable type
31. Myelin fiber

12. Recommended literature

Basic:

1. Bobrysheva I. V. Histology, cytology, embryology / I. V. Bobrysheva, S. A. Kashchenko. – Lugansk.: “Knoledge”, 2011. – 437 p.
2. Arnautova L.V. Histology f course of lectures /L. V. Arnautova, O. A. Ulyantseva. – Odessa.: The Odessa National Medical University, 2012. – 201 p.

Additional literature:

1. Ross M.H., Pawlina W. Histology: a text and atlas6th edition. - Lippincott Williams & Wilkins, 2011. - 996 p.

2. Kierszenbaum A. L. Histology and cell biology: an introduction to pathology3rd edition. -A. L. Kierszenbaum. – Elsevier, 2011. – 720 p.

3. Dongmei Cui M.S. et al., Atlas of Histology with Functional & Clinical Correlations. - Un. of Missisipi MC, 2011.

13. Electronic information resources

Department page: https://info.odmu.edu.ua/chair/histology/files

All materials of the department in English language (dental faculty):

https://info.odmu.edu.ua/chair/histology/files/40/en

Textbook "Short course of lectures on general histology"

https://info.odmu.edu.ua/chair/histology/fileinfo/481/124419

Textbook "Short course of lectures on special histology"

https://info.odmu.edu.ua/chair/histology/fileinfo/481/124420

Calendar-thematic plan

https://info.odmu.edu.ua/chair/histology/fileinfo/481/124427

Test tasks of the KROK 1 format to prepare for the final control

https://info.odmu.edu.ua/chair/histology/fileinfo/481/124428