Ministry of Health of the Russian Federation

federal state budgetary educational institution
higher education
"North-Western State Medical University named after I.I. Mechnikov"

Ministry of Health of the Russian Federation

(Federal State Budgetary Educational Institution of Higher Education North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia)

DISCIPLINE WORK PROGRAM

"Histology, Embryology, Cytology"

Specialty: 31.05.01 General Medicine

Specialization: **Organization and provision of primary health care to the adult population in medical organizations**

Implementation language: Russian, English

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The work program of the discipline "Histology, embryology, cytology" is compiled on the basis of the Federal State Educational Standard of Higher Education - specialty in the specialty 31.05.01 General Medicine, approved by Order of the Ministry of Science and Higher Education of the Russian Federation dated August 12, 2020 No. 988 "On approval of the Federal State Educational Standard of Higher Education - specialty in 31.05.01 General Medicine."

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The work program of the discipline was discussed at a meeting of the Department of Human Morphology
April 01, 2021, Protocol No12.,

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Approved by the Methodological Commission for the specialty 31.05.01 General Medicine

May 11, 2021
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May 20, 2021
Chairman _____ / Artyushkin S.A./
(signature)

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1. The purpose of mastering the discipline

The purpose of mastering the discipline "Histology, embryology, cytology" is to form in the student basic knowledge of cytology, embryology and histology to understand the processes occurring in the human body, from the standpoint of modern ideas about its cellular and tissue structure, necessary for further training in clinical departments, as well as ideas about the sources of regeneration of tissues and organs and the range of their reparative capabilities.

2. The place of discipline in the structure of the educational program

The discipline "Histology, embryology, cytology" belongs to the mandatory part of Block 1 "Disciplines (modules)" of the main professional educational program in the specialty 31.05.01 General Medicine (specialty level of education), focus: Organization and provision of primary health care to the adult population in medical organizations. The discipline is mandatory to study.

3. List of planned learning outcomes in the discipline, correlated with the planned results of mastering the educational program

Code and name of competency	Code and name of the competency achievement indicator
OPK-5 Able to assess morphofunctional, physiological states and pathological processes in the human body to solve professional problems	ID-3 OPK-5.3 Determines the main indicators of the patient's physical development and functional state, taking into account the anatomical and physiological characteristics of the patient's age
OPK-10. Able to understand the operating principles of modern information technologies and use them to solve professional problems	ID-1 OPK-10.1. Applies modern information technologies, searches for information on the Internet to solve professional problems

Competency achievement indicator code	Learning outcomes (assessment indicators)	Evaluation tools
ID-3 OPK-5.3	**Knows:** − structural and functional organization of cells and their derivatives; − basic patterns of embryonic and postembryonic morphogenesis (proliferation, growth, differentiation, apoptosis, cell interaction in the process of histo- and organogenesis) of a healthy person; − structural and functional organization of tissues; - structure of healthy human organs; adaptation, regeneration and age-related changes in organs.	test questions, situational tasks demonstration of practical skills task on histological specimen
	Can − identify the structures of cells and their	

	derivatives at the micro- and ultramicroscopic level. Recognize morphological signs of changes in functional activity, manifestations of reactivity, apoptosis and restoration of cell structure; - identify the processes of embryonic morphogenesis (proliferation, growth, differentiation, adaptation, regeneration, apoptosis and cell interaction); - identify the structural and functional features of human tissues; - identify the structural and functional characteristics of the organs of a healthy person, morphological manifestations of adaptation, regeneration and age-related changes.	
	Has the skill - skills in interpreting the structural features of cells reflecting the life cycle, functional specialization, adaptation, reactivity and ability to recover; - skills in analyzing the processes of embryonic morphogenesis (proliferation, growth, differentiation, adaptation, regeneration, apoptosis and cell interaction); - skills in identifying human tissues, assessing regenerative potential and age-related changes in tissues; - organ research skills (type of structure, tissue composition, key morphological features, relationship between structure and function, regenerative potential and age-related changes).	
ID-1 OPK-10.1	**Knows** main information bibliographic and Internet resources in the field of cytology, histology and embryology	test questions, situational tasks demonstration of practical skills task on histological specimen
	Can find and analyze basic information bibliographic and Internet resources in the field of cytology, histology and embryology	
	Has the skill modern cytological, histological and embryological terminology and skills in searching for the necessary educational and scientific information on the Internet	

4. Scope of discipline and types of academic work

Type of educational work	Labor intensity	Semesters	
		2	3
Contact work between students and teachers	**124**	**48**	**76**
Classroom work:	120	48	72

Lectures (L)	40	16	24
Practical exercises (PP)	80	32	48
Independent work:	**92**	**30**	**62**
during theoretical training	60	30	30
preparation for the exam	32		32
Interim certification: exam, including passing and group consultations	4		4
Total labor intensity of academic hours	**216**		
credit units	**6**		

5. The content of the discipline, structured by sections (topics) indicating the number of academic hours and types of training sessions

5.1.Content of discipline sections

No.	Name of discipline section	Annotated content of the discipline section	List of competencies formed in the process of mastering the section
1	Cytology and embryology	Objects of study. Levels of study. Methods of histological examination. Types of microscopy. Light microscopy. Preparation of histological specimen. Histological stains. Acquiring skills in working with a light microscope. Cytology. Cells as functionally leading elements of tissue. The concept of a cell as the basic unit of living things. Cells as the main elements of tissue. Non-cellular structures as derivatives of cells. General plan of the structure of eukaryotic cells: cell membrane, cytoplasm, nucleus. Functional apparatus of the cell: structures and functions. Microscopic and ultramicroscopic structure of cell organelles, cytolemma and nucleus. Specialized cell surface structures as signs of cell differentiation. Morpho-functional classification of types of specialized structures. Human embryonic development. Embryology. Human embryogenesis: main stages and their characteristics. The initial period of human development. Implantation. Placenta - development, morphofunctional characteristics, microscopic structure at different stages of pregnancy. Provisional organs – education, morphofunctional features	OPK-5, OPK-10
2	General histology	Tissue development (histogenesis) Tissues as a system of cells and their derivatives. Cell types. Life cycle of a cell. Morphofunctional characteristics of the processes of growth and differentiation, the period of active functioning,	OPK-5, OPK-10

		aging and cell death. The concept of cellular differentiation. Concept of cell populations. Static, growing, renewing cell populations. Histogenesis is the process of tissue development and restoration. Embryonic histogenesis. Stem cells and their properties. Determination and differentiation of cells in a series of successive divisions, commitment of potency. Epithelial tissues. General characteristics of epithelial tissues - classification, sources of embryonic development. General morpho-functional characteristics of surface epithelia, their classification, features of microscopic and ultramicroscopic structure. Principles of structural organization and ensuring the fulfillment of functions. Glandular epithelia. Morphofunctional characteristics of glandulocytes, their light-optical and electron microscopic characteristics. Glands - types, morphological classification. Functional characteristics of the exocrine glands. Tissues of the internal environment. Blood system. Tissues of the internal environment - general characteristics, classification. Blood - components and functions of blood. Morpho-functional characteristics of blood cells, their microscopic and ultramicroscopic structure. Age and gender characteristics of blood. Lymph, components, functions, connection with blood. The concept of lymphocyte recycling. Embryonic and postembryonic hematopoiesis. Concept of blood stem cells. Differentons of shaped elements. Connective tissues Connective tissues - general characteristics and classification. Types of connective tissues – histophysiological features, cellular composition. Morphofunctional characteristics of cell types, their microscopic and ultramicroscopic structure. Sources of embryonic development, differential composition. Intercellular substance of tissue - chemical composition, properties, formation. Participation in the performance of functions. Chondrogenesis and age-related changes in cartilage tissue. Direct and indirect osteohistogenesis. Regeneration and age-related changes in bone tissue Muscle tissue. Muscle tissue - general characteristics, classification. Morphofunctional characteristics of muscle tissue types, sources of embryonic development. Structural elements of	

		tissues - microscopic and ultramicroscopic structure. Functional devices. The mechanism of muscle contraction. Regeneration of muscle tissue. Muscle as an organ. Nervous tissue. Nervous tissue – general characteristic. Nervous tissue cells – morphofunctional characteristics. Microscopic and ultramicroscopic structure of neurons. Nerve fibers - types, features of formation, structure and function. The concept of a reflex arc. Nerve endings – morphofunctional characteristics, types. Embryonic histogenesis. Regeneration of structural components of nervous tissue.	
3	Private histology	Nervous system. Nervous system. – characteristics, functions, sources and course of embryonic development. Structures of the peripheral nervous system - structure, functions, tissue composition, microscopic characteristics, regeneration. Central nervous system. The structure of gray and white matter. The concept of nerve centers and pathways. Brain regions – morphofunctional characteristics, cellular composition, microscopic structure. Sensory system. The sensory system is the concept of analyzers. Sense organs - classification, general principle of cellular organization of receptor sections. Morphofunctional characteristics, tissue composition, receptor component, sources of embryonic development, histogenesis of the organs of vision, hearing, smell, taste. Cardiovascular system Cardiovascular system, general structure plan, functions. Blood vessels - general principles of structure, tissue composition, classification, microscopic structural features. The concept of the microvasculature. Angiogenesis, vascular regeneration. Heart - embryonic development, wall structure. Wall shells - tissue composition, microscopic structure. Morpho-functional characteristics of cardiomyocytes. The system of hematopoiesis and immune defense The system of hematopoiesis and immune defense - general characteristics, the main sources and stages of the formation of hematopoiesis in human ontogenesis. Central and peripheral organs - morphofunctional characteristics, tissue composition, cellular composition, microscopic and ultramicroscopic structure, features of vascularization, role in hematopoiesis. Hematopoiesis. Lymphocytopoiesis - characteristics, content and	OPK-5, OPK-10

		significance of the stages. Morphological basis of the body's defense reactions. system. Endocrine system - general characteristics, functions, classification. The concept of hormones - groups, properties, mechanisms of action. Central and peripheral structures of the endocrine system - morphofunctional characteristics, sources of development, tissue composition, cellular composition, microscopic and ultramicroscopic structure. Interaction of parts of the endocrine system, regulation of their activities. Digestive system Digestive system - general characteristics, functions, sources of embryonic development. The general principle of the structure of the wall of the digestive canal is tissue and cellular composition. Structural features of the structures and sections of the digestive tube, functions, tissue and cellular composition, microscopic structure. Features of the structure of the membranes in various parts of the organ - cytophysiological characteristics of the integumentary epithelium of the mucous membrane, localization, structure and cellular composition of the glands, micro- and ultramicroscopic features of the structure of cells. Large digestive glands - general characteristics, functions, sources of embryonic development. Pancreas - structure of exocrine and endocrine sections, cellular composition, functions. Liver - morphofunctional characteristics, lobule structure, tissue and cellular composition, features of blood supply. The structure of the biliary tract. Salivary glands - classification, structure of secretory sections, excretory ducts. Microscopic structure of organs, cytophysiology of their cellular elements Respiratory system. Leather and its derivatives. Respiratory system - general characteristics, sections, functions, embryonic sources of development. Features of the structure of the wall of the airways - the tissue composition of the membranes, the cellular composition of the epithelium of the mucous membrane. Lungs - respiratory section, functional characteristics. Acinus - structural components, structure of the wall of the alveoli and interalveolar septa. Tissue and cellular composition, microscopic structure, cytophysiological characteristics of cellular elements. Skin and its derivatives –	

		morphofunctional characteristics, tissue composition, development, regeneration. The main cell differentials in the epidermis. Excretory system System of urinary and urinary organs - characteristics, functions, embryonic sources of development. Kidneys – structure, vascularization, tissue composition. Nephron - types, histophysiological characteristics, cellular composition, microscopic and ultramicroscopic structure, participation in the process of urine formation. Endocrine apparatus of the kidney - cellular composition, function. Urinary tract - wall structure, tissue composition. Reproductive system. Reproductive system - structure, functions, embryonic sources of development of the male and female reproductive systems. Testicle - features of structural organization, histophysiological characteristics, tissue and cellular composition, microscopic structure. Spermatogenesis. Vas deferens - features of structural organization and microscopic structure. Structure and histophysiological characteristics of accessory glands. Ovary - features of structural organization, histophysiological characteristics, tissue and cellular composition, microscopic structure. Structural plan and morphofunctional characteristics of the organs of the female reproductive tract. Ovarian-menstrual cycle - stages, regulation. Mammary gland - functional morphology during periods of its various activities	

5.2.Thematic plan of lectures

No.	Name of discipline section	Lecture topics	Active forms of learning	Labor intensity (academic hours)
2nd semester				
1	Cytology and embryology	L.1 Histology as a science and academic discipline. Tissue cells. Reproduction and differentiation of tissue cells.	-	2
2		L.2 Human embryogenesis	-	2
3	General histology	L.3 General histology. The doctrine of tissues. Epithelial tissues.	-	2
4		L.4 Tissues of the internal environment. Blood and lymph as tissues. Hematopoiesis.	-	2

		Development of blood cells. Blood stem cell		
5		L.5 Connective tissues. RVST, Morphology of inflammation	-	
6		L.6 Cartilage and bone tissues	-	2
7		L.7 Muscle tissue.	-	2
8		L.8 Nervous tissue.		
		3rd semester		
9	Private	L.9 Nervous system	-	2
10	histology	L.10 Sense organs	-	2
11		L.11 Vascular system. Heart.	-	2
12		L.12 System of hematopoietic organs and immunological defense.	-	2
13		L. 13. Endocrine system	-	2
14		L.14 Digestive system (general plan of the structure of the digestive canal, GEP system). Anterior section.	-	2
15		L.15 Digestive system (middle section, pancreas, liver)	-	2
16		L.16 Respiratory system.	-	2
17		L.17 Skin system	-	2
18		L.18 System of organs of urination and excretion.	-	2
19		L.19 Male reproductive system.	-	2
20		L.20 Female reproductive system	-	2
		TOTAL:		40

5.3.Thematic plan for practical classes

№ p/p	Name of discipline section	Topics of practical classes	Active forms of learning	Current control forms	Labor intensity (academic hours)
semester 2					
1.	Cytology and embryology	PZ. 1 Methods of cytological, embryological and histological studies. Reproduction and differentiation of tissue cells..	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
2.		PZ.2 Development and structure of germ cells Early stages of human embryogenesis: fertilization, cleavage, gastrulation. .	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
3.		PZ. 3 Human embryogenesis: embryonic histogenesis. Implantation	GD	test questions, situational tasks demonstration of practical skills	4

		Human provisional organs, placenta, critical periods of development		task on histological specimen	
4.	General histolog	PZ.4 The doctrine of tissues. Epithelial tissue general characteristics and classifications, integumentary epithelia (ectodermal, endoderma nephrodermal, coelomic and neuroglial types) Glandular epithelia	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
5.		PZ.5 Tissues of the internal environment: general characteristics and classification. Mesenchyme. Blood and lymph as tissues. Structure and functions of blood cells. Embryonic and postnatal hematopoiesis. Loose fibrous connective tissue. Connective tissues with special properties. Dense connective tissue	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
6.		PZ.6 Cartilage tissues Bone tissue	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
7.		PZ 7. Test 1	GD	Testing, test questions, situational tasks demonstration of practical skills task on histological specimen	4
8.		PZ.8 Muscle tissue: classification, development, structure. Nervous tissue: classification, development, structure		test questions, situational tasks demonstration of practical skills task on histological specimen	4
semester 3					
9.		PZ.9 Nervous system. Spinal cord system. Autonomic nervous system. Cerebellum. Cerebral cortex.	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4

10.	Private histology	PZ.10 Sense organs	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
11.		PZ.11 Test 2	GD	Testing, test questions, situational tasks demonstration of practical skills task on histological specimen	4
12.		PZ.12 Cardiovascular system: arteries, veins, microvasculature, heart wall	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
13.		PZ.13 Organs of hematopoiesis and immunological defense	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
14.		PZ.14 Endocrine system central and peripheral organs.	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
15.		PZ.15 Digestive system general characteristics. Anterior section: tongue tonsils, teeth, esophagus. Digestive system: middle and posterior sections (stomach, small and larg intestine).	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
16.		PZ.16 Digestive system digestive glands (Salivary glands, liver and pancreas),	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
17.		PZ.17 Test 3	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
18.		PZ.18 Respiratory system: airways and	GD	test questions, situational tasks	4

		respiratory department. Skin system. Excretory system Endocrine apparatus of the kidney.		demonstration of practical skills task on histological specimen	
19.		PZ.19. Male reproductive system. Female reproductive system	GD	test questions, situational tasks demonstration of practical skills task on histological specimen	4
20.		PZ 20. Diagnosticum of histological preparations		test questions, situational tasks demonstration of practical skills task on histological specimen	4
TOTAL:					80

GD - group discussion

5.4. Thematic plan of seminars – not provided

5.5. Thematic plan of laboratory work - not provided

5.6. Independent work:

No.	Name of discipline section	Types of independent work*	Current control forms	Labor intensity (academic hours)
1	Cytology and embryology	Working with lecture material Working with educational literature	Testing Interview.	15
2	General histology	Working with lecture material Working with educational literature	Testing Interview.	15
3	Private histology	Working with lecture material Working with educational literature	Testing Interview.	30
TOTAL:				60
Exam Preparation:				32

6. Guidelines for students on mastering the discipline

Training in the discipline “Histology, embryology, cytology” consists of contact work, including lectures, practical classes and independent work.

Lectures are conducted using demonstration material in the form of presentations. Practical classes take place in classrooms using presentations and histological preparations. During the classes, students discuss theoretical issues, study histological preparations using a

light microscope, images of cells and their structures obtained using an electron microscope, solve situational problems, and answer test questions.

Test work is a type of lesson in which ongoing monitoring of the student's progress is carried out. When preparing for the test, you must carefully study the lecture materials, additional provided illustrative and information materials and recommended literature, master practical skills in identifying histological preparations and the structures presented on them using a light microscope, and also work through situational problems that were discussed in class or recommended for independent solution.

Independent work involves preparation for practical classes and tests and includes work with a light microscope and histological preparations, study of lecture material, additional illustrative and information materials presented on the website of the department, EOIS of the University, literature on the topic (recommended textbooks, teaching aids, familiarization with materials published on recommended medical sites).

Various types of educational work, including independent work of the student, contribute to the development of skills: differentiation of cell components and their derivatives, as well as analysis of the functional activity of cells using ultramicroscopic and microscopic research methods; recognition and differentiation of histological elements of tissues and organs using various microscopy methods; identification of human tissues, assessment of regenerative potential and age-related changes in tissues; skills in studying organs (type of structure, tissue composition, key morphological characteristics, relationship between structure and function, regenerative potential and age-related changes), which ultimately forms the basis for the formation of general professional competencies.

7. Evaluation materials

Evaluation materials for the discipline for ongoing monitoring of progress and intermediate certification of students include examples of evaluation tools (Appendix A to the work program of the discipline), procedure and assessment criteria.

8. List of educational literature and Internet resources necessary for mastering the discipline

8.1. Educational literature:

1. Histology, embryology, cytology: textbook [for medical students. Universities, for interns, residents, graduate students, teachers] / ed. Yu. I. Afanasyev, N. A. Yurina. - 6th ed., revised. and additional - M.: GEOTAR-Media, 2018. - 800 p. : color rice. - ISBN 978-5-9704-4780-2.
2. Atlas of the microscopic and ultramicroscopic structure of cells, tissues and organs: Textbook. manual for medical students. Universities / V. G. Eliseev, Yu. I. Afanasyev, E. F. Kotovsky, A. N. Yatskovsky. - 5th ed., revised. and additional - M.: Medicine, 2004. - 447 p. : color ill. - (Textbook for students of medical universities).
3. Histology Guide [Electronic resource]/ ed. R.K.Danilova. – 2nd ed., rev. and additional – St. Petersburg: SpetsLit, - 2011 – T.2. – 511 p. – Access mode: www. studmedlab.ru (Student consultant: electronic library of a medical university).
4. Kolesnikov L.L., Terminologia Embryologica. International terms on human embryology with an official list of Russian equivalents [Electronic resource] / Kolesnikov L.L., Shevlyuk N.N., Erofeeva L.M. - M.: GEOTAR-Media, 2014. - ISBN 978-5-9704-3080-4 - Access mode: http://www.studmedlib.ru/book/ISBN9785970430804.html
5. Danilov, R.K. General and medical embryology: Textbook for students of medical universities / R.K. Danilov, T.G. Borovaya. - St. Petersburg. : SpetsLit, 2003. - 231 p.

6. Volkova, O. V. Embryogenesis and age-related histology of human internal organs / O. V. Volkova, M. I. Pekarsky. - M.: Medicine, 1976. - 414 p.
7. Bykov V.L., Histology, cytology and embryology. Atlas [Electronic resource]: textbook / Bykov V.L., Yushkantseva S.I. - M.: GEOTAR-Media, 2015. - 296 p. - ISBN 978-5-9704-3201-3 - Access mode: https://www.rosmedlib.ru/book/ISBN9785970432013.html
8. Boychuk N.V., Histology. Atlas for practical classes [Electronic resource] / Boychuk N.V., Islamov R.R., Kuznetsov S.L., Chelyshev Yu.A. - M.: GEOTAR-Media, 2014. - 160 p. - ISBN 978-5-9704-2819-1 - Access mode: http://www.studmedlib.ru/book/ISBN9785970428191.html
9. Instructions for practical classes in the discipline “Histology, embryology, cytology: educational manual / ed. D. A. Starchik. – St. Petersburg: North-Western State Medical University Press named after I.I. Mechnikov of the Ministry of Health of Russia, 2023. – 136 p. https://sdo.szgmu.ru/pluginfile.php/879683/mod_resource/content/1/%D0%A1%D1%82%D0%B0%D1%80%D1%87%D0%B8%D0%BA_%D0%A3%D0%BA%D0%B0%D0%B7%D0%B0%D0%BD%D0%B8%D1%8F%20%D0%BA%20%D0%BF%D1%80%D0%B0%D0%BA%D1%82%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%B8%D0%BC%20%D0%B7%D0%B0%D0%BD%D1%8F%D1%82%D0%B8%D1%8F%D0%BC.p
10. Situational tasks in the discipline “Histology, embryology, cytology: workshop/ed. D.A. Starchik. –SPb.: North-Western State Medical University Press named after I.I. Mechnikov of the Ministry of Health of Russia, 2023. – 64 p. https://sdo.szgmu.ru/pluginfile.php/879687/mod_resource/content/1/%D0%A1%D1%82%D0%B0%D1%80%D1%87%D0%B8%D0%BA_%D0%A1%D0%B8%D1%82%D1%83%D0%B0%D1%86%D0%B8%D0%BE%D0%BD%D0%BD%D1%8B%D0%B5%20%D0%B7%D0%B0%D0%B4%D0%B0%D1%87%D0%B8%20%D0%BF%D0%BE%20%D0%B3%D0%B8%D1%81%D1%82%D0%BE%D0%BB%D0%BE%D0%B3%D0%B8%D0%B8.pdf
11. Histology, embryology, cytology: textbook / Yu. I. Afanasyev, B. V. Aleshin, N. P. Barsukov [etc.] ; edited by Yu. I. Afanasyeva, N. A. Yurina. - 7th ed. , processed and additional - Moscow: GEOTAR-Media, 2024. - 832 p. - ISBN 978-5-9704-8785-3. - Text: electronic // Electronic Library System "Student Consultant": [website]. - URL : https://www.studentlibrary.ru/book/ISBN9785970487853.html
12. Danilov, R. K. Histology. Embryology. Cytology: atlas-reference book: study guide / R.K. Danilov. – M.: GEOTAR-Media, 2021. – 430 p. Danilov, R. K. Histology, embryology, cytology. Atlas-reference book: textbook / R. K. Danilov. - Moscow: GEOTAR-Media, 2021. - 432 p. - ISBN 978-5-9704-6335-2. - Text: electronic // Electronic Library System "Student Consultant": [website]. - URL : https://www.studentlibrary.ru/book/ISBN9785970463352.html
13. Kolesnikov, L. L. Terminologia Embryologica. International terms in human embryology with an official list of Russian equivalents / Kolesnikov L. L., Shevlyuk N. N., Erofeeva L. M. - Moscow: GEOTAR-Media, 2014. - 422 p. - ISBN 978-5-9704-3080-4. - Text: electronic // Electronic Library System "Student Consultant": [website]. URL:https://www.studentlibrary.ru/book/ISBN9785970430804.html
14. Bykov, V. L. Histology, cytology and embryology. Guide to practical exercises. Atlas: textbook / V. L. Bykov. - Moscow: GEOTAR-Media, 2022. - 1032 p. - ISBN 978-5-9704-5225-7. - Text: electronic // Electronic Library System "Student Consultant": [website]. - URLhttps://www.studentlibrary.ru/book/ISBN9785970452257.html

8.2. Resources of the Internet information and telecommunications network:

Name of Internet resource	Email address of the resource

We study histology remotely (educational and methodological complex for independent work)	http://hist.yma.ac.ru/

9. List of information technologies used to master the discipline, including a list of software, professional databases and information reference systems

9.1. List of information technologies used in the educational process:

No.	Name of discipline section	Information technology
1	Cytology and embryology	posting of educational materials in EIEE FSBEI HE North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia, https://moodle.szgmu.ru/mod/quiz/view.php?id=93275
2	General histology	posting of educational materials in EIEE FSBEI HE North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia, https://moodle.szgmu.ru/mod/quiz/view.php?id=49463
3	Private histology	posting of educational materials in EIEE FSBEI HE North-Western State Medical University named after I.I. Mechnikov of the Russian Ministry of Health, https://moodle.szgmu.ru/mod/assign/view.php?id=86488

9.2. List of software used in the educational process (licensed and freely distributed software, including domestically produced):

No.	Software product name	License validity period	Documents confirming right to use software products
licensed software			
1.	ESET NOD 32	1 year	Government contract № 07/2020
2.	MS Windows 8 MS Windows 8.1 MS Windows 10 MS Windows Server 2012 Datacenter - 2 Proc MS Windows Server 2012 R2 Datacenter - 2 Proc MS Windows Server 2016 Datacenter Core	Unlimited	State contract No. 30/2013-O; Government contract No. 399/2013-OA; Government contract No. 07/2017-EA.
3.	MS Office 2010 MS Office 2013	Unlimited	Government contract No. 30/2013-OA; Government contract No. 399/2013-OA.
4.	Academic LabVIEW Premium Suite (1 User)	Unlimited	Government contract № 02/2015
licensed software of domestic production			
1.	Anti-plagiarism	1 year	Government contract

			№ 2409
2.	“WEBINAR (WEBINAR)” VERSION 3.0	1 year	Contract No. 347/2020-M
3.	"3KL e-learning environment"	1 year	Contract No. 348/2020-M
4.	TrueConf Enterprise	1 year	Contract No. 396/2020-EA
free software			
1.	Google Chrome	Unlimited	Open License Agreement GNU GeneralPublicLicense
2.	NVDA	Unlimited	Open License Agreement GNU GeneralPublicLicense
freely distributed software of domestic production			
1.	Moodle	Unlimited	Open License Agreement GNU GeneralPublicLicense

9.3. List of professional databases and information reference systems:

o.	Name software product	License validity period	Documents confirming right to use software products	Mode access for disabled students and persons with limited health capabilities
1.	Consultant Plus	1 year	Agreement No. 655/2020-EA	-
2.	EBS “Student Consultant”	1 year	Contract No. 307/2020-EA	http://www.studmedlib.ru/
3.	EMB “Doctor Consultant”	1 year	Contract No. 281/2020-EA	http://www.rosmedlib.ru/
4.	EBS "Ibooks.ru/ibooks.ru"	1 year	Contract № 06/2020	https://ibooks.ru
5.	EBS “IPRBooks”	1 year	Contract No. 08/2020-ZK	http://www.iprbookshop.ru/special
6.	Electronic library system “Bukap”	1 year	Contract № 05/2020	https://www.books-up.ru/
7.	EBS "Lan Publishing House"	1 year	Contract No. 395/2020-EA	https://e.lanbook.com/

10. Material and technical support of discipline

Classrooms for conducting lecture-type training sessions, group and individual consultations, ongoing monitoring of progress and intermediate certification of students, equipped with equipment and technical means of teaching: St. Petersburg, Piskarevsky Prospekt, 47, lit AL (building 26), room. No. 5, lit. R. FSBEI HE North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia; Equipment: board (chalk); teacher's table, student's four-seater table, light microscopes, histological preparations. Technical teaching aids: multimedia projector, teacher’s laptop, system unit, monitor.
Special technical teaching aids: Roger Pen (Roger personal wireless transmitter in the form of a pen), Roger MyLink (Roger Pen system signal receiver) (for students with hearing impairments); IntelliKeys (wired keyboard with Russian Braille with a matte black finish), (St. Petersburg, Piskarevsky Prospekt, 47, lit. R (building 9), room No. 18.19, Federal State Budgetary Educational Institution of Higher Education North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia).

Classrooms for conducting seminar-type training sessions, group and individual consultations, ongoing monitoring of progress and intermediate certification of students, equipped with equipment and technical means of training. St. Petersburg, Piskarevsky

Prospekt, 47, lit AL (building 26), room. No. 5, lit. R. FSBEI HE North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia;
Equipment: board (chalk); teacher's table, student's four-seater table, light microscopes, histological preparations
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Premises for independent work of students, equipped with computer equipment with the ability to connect to the Internet and provided with access to the electronic information and educational environment of the University: St. Petersburg, Piskarevsky Prospekt, 47, lit. AE (building 32), room. No. 1, lit. R (building 9), room. No. 18.19 FSBEI HE North-Western State Medical University named after I.I. Mechnikov of the Russian Ministry of Health.

Appendix A

Ministry of Health of the Russian Federation

federal state budgetary educational institution
higher education
"North-Western State Medical University
named after I.I. Mechnikov"
Ministry of Health of the Russian Federation

(Federal State Budgetary Educational Institution of Higher Education North-Western State Medical University named after I.I. Mechnikov of the Ministry of Health of Russia)

EVALUATION MATERIALS

(for ongoing monitoring of progress and intermediate certification of students)

Specialty:	31.05.01 General medicine
Direction:	Organization and provision of primary health care to the adult population in medical organizations
Name of discipline:	Histology, Embryology, Cytology

St. Petersburg – 2021

1. List of planned learning outcomes in the discipline

Competency achievement indicator code	Learning outcomes (assessment indicators)	Evaluation tools
ID-3 OPK-5.3	**Knows:** - structural and functional organization of cells and their derivatives; - basic patterns of embryonic and postembryonic morphogenesis (proliferation, growth, differentiation, apoptosis, cell interaction in the process of histo- and organogenesis) of a healthy person; - structural and functional organization of tissues; - structure of healthy human organs; adaptation, regeneration and age-related changes in organs.	test questions, situational tasks demonstration of practical skills task on histological specimen
	Can - identify the structures of cells and their derivatives at the micro- and ultramicroscopic level. Recognize morphological signs of changes in functional activity, manifestations of reactivity, apoptosis and restoration of cell structure; - identify the processes of embryonic morphogenesis (proliferation, growth, differentiation, adaptation, regeneration, apoptosis and cell interaction); - identify the structural and functional features of human tissues; - identify the structural and functional characteristics of the organs of a healthy person, morphological manifestations of adaptation, regeneration and age-related changes.	
	Has the skill - skills in interpreting the structural features of cells reflecting the life cycle, functional specialization, adaptation, reactivity and ability to recover; - skills in analyzing the processes of embryonic morphogenesis (proliferation, growth, differentiation, adaptation, regeneration, apoptosis and cell interaction); - skills in identifying human tissues, assessing regenerative potential and age-related changes in tissues; - organ research skills (type of structure, tissue composition, key morphological features, relationship between structure and function, regenerative potential and age-related changes).	
ID-1 OPK-10.1	**Knows**	test questions,

	main information bibliographic and Internet resources in the field of cytology, histology and embryology	situational tasks demonstration of practical skills task on histological specimen
	Can find and analyze basic information bibliographic and Internet resources in the field of cytology, histology and embryology	
	Has the skill modern cytological, histological and embryological terminology and skills in searching for the necessary educational and scientific information on the Internet	

2.Examples of assessment tools and assessment criteria for conducting ongoing monitoring

2.1. Examples of incoming control

Question 1.

Match the functions of tissues and their type - epithelial, connective or nervous:

FABRIC TYPE	FUNCTIONS
1) epithelial	A) regulation of vital processes
2) connecting	B) deposition of nutrients into reserves
3) nervous	B) movement of substances in the body
	D) protection from ultraviolet radiation
	D) ensuring metabolism between the body and the environment

Write down the numbers in your answer, arranging them in the order corresponding to the letters:

A	B	B	G	D

Question 2.

Establish a correspondence between the organ, tissue of a vertebrate animal and the germ layer from which they are formed.

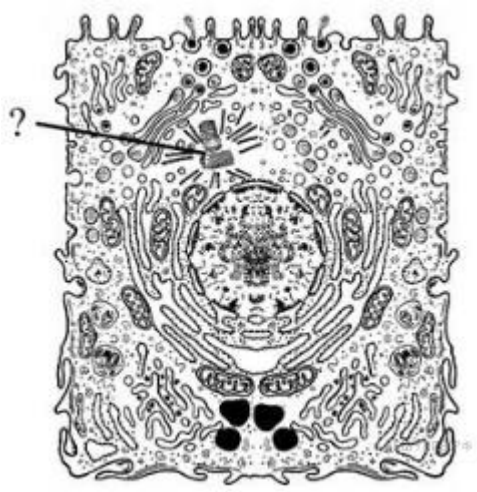
ORGAN, TISSUE	GERMAL LEAF
A) intestines	1) endoderm
B) blood	2) mesoderm
B) kidneys	
D) lungs	
D)cartilage tissue	
E)cardiac muscle	

Write down the numbers in your answer, arranging them in the order corresponding to the letters:

A	B	B	G	D	E

Question 3.

The terms listed below, except two, are used to characterize the cell organelle, indicated in the figure by a question mark. Identify two terms that "drop out" from the general list and write down the numbers under which they are indicated in the table.



1) membrane organelle
2) replication
3) chromosome divergence
4) centrioles
5) spindle

Assessment criteria, incoming inspection assessment scale

Rating	Description
"passed"	Demonstrates a thorough understanding of the problem. All requirements for the task have been met
"not accepted"	Demonstrates a lack of understanding of the problem. Many requirements for the task have not been met. No answer. There was no attempt to solve the problem

2.2. Examples of test tasks

ID-3 OPK-5.3, ID-1 OPK-10.1

Question 1.

Epithelial tissues are characterized by the following main morphological features:

1. Presence of process cells connected by synaptic contacts
2. The location of cells at a considerable distance from each other, the predominance of intercellular substance with a high content of fibers
3. The arrangement of cells in the form of isogenic groups, the predominance of intercellular substance with a high content of fibers and sulfated glycosaminoglycans
4. The predominance of intercellular substance and its significant mineralization, cells are connected by processes
5. **Borderline position, presence of basement membrane, arrangement of cells in the form of layers**

Question 2.

The epithelium is delimited from the connective tissue:

1. Elastic membrane
2. Plasmolemma
3. **Basement membrane**
4. Elastic fibers
5. Intermediate filaments

Question 3.
The epithelium is called transitional if:

1. It can be converted from single-layer to multi-layer
2. All cells are connected to the basement membrane, the cells have unequal height and shape, the cell nuclei are located at different levels
3. All cells are connected to the basement membrane, the cell nuclei are located at the same level
4. Possible transformation from non-keratinizing to keratinizing
5. **Depending on the functional state of the organ, the number of rows of cells and their shape changes**

Evaluation criteria, test grading scale rear

Rating		**Description**
"excellent"	5	Completed in full – 90%-100%
"good"	4	Not fully implemented – 80%-89%
"satisfactory"	3	Completed with deviation – 70%-79%
"unsatisfactory"	2	Partially completed – 69% or less correct answers

2.3.Interview questions

ID-3 OPK-5.3, ID-1 OPK-10.1

1. The concept of fabrics, their classification. The theory of tissue evolution by A.A. Zavarzin and N.G. Khlopin. Tissue as a system of interacting cellular differons.
2. Structural and functional elements of tissues: cells, intercellular substance, postcellular structures, symplasts. Development and regeneration of tissues. The concept of physiological and reparative tissue regeneration.
3. Epithelial tissues. Morphofunctional characteristics and classification. Features of integumentary, glandular and sensory epithelia. Morphological characteristics of epithelium. The concept of the basement membrane and intercellular contacts.
4. Morphological and histogenetic classification of epithelial tissues.
5. Glandular epithelia. Structure and histophysiology of glands. Secretory cycle. Classification of glands. Merocrine, apocrine and holocrine types of secretion. The concept of exo- and endocrine glands.

Evaluation criteria, question grading scale

Rating		**Description**
"excellent"	5	Knows all the educational material, understands it perfectly and has thoroughly mastered it. Gives correct, conscious and confident answers to questions (within the program). In oral answers he uses literary correct language and does not make mistakes.
"good"	4	Knows all the required educational material, understands it well and has mastered it firmly. Answers questions (within the program) without difficulty. In oral answers he uses literary language and does not make gross mistakes
"satisfactory"	3	Knows basic educational material. Answers questions (within the limits of the program) with difficulty. In oral answers, he makes mistakes when presenting the material and in constructing his speech.
"unsatisfactory"	2	Does not know most of the educational material, answers, as a rule, only to the teacher’s leading questions, hesitantly. Makes frequent and serious mistakes in oral answers

2.4.Situational tasks

ID-3 OPK-5.3, ID-1 OPK-10.1

Task. The histological specimen reveals an organ with a lobular structure. Each lobule has a cortex and medulla. The parenchyma of the lobules is formed by lymphoid tissue, which contains T-lymphocytes at different stages of proliferation and differentiation. The microenvironment is represented by epithelioreticular cells. Hassall's corpuscles are detected in the medulla. What organ has this histological structure?

Quests:

1. Name the sources of organ development.
2. List the tissue composition of the organ.
3. Characterize the morphofunctional features of the organ.
4. Characterize the leading cellular differon.
5. Evaluate the regenerative capabilities of the organ.

Evaluation criteria, rating scale for situational tasks

Rating		**Description**
"excellent"	5	Explanation of the process of solving a situational problem is detailed, consistent, competent, with theoretical justifications, with the necessary schematic images and visual demonstrations, with correct and fluent use of terminology; answers to additional questions are correct and clear
"good"	4	Explanation of the process of solving a situational problem is detailed, but not logical enough, with isolated errors in details, some difficulties in theoretical justification, schematic images and visual demonstrations, answers to additional questions are correct, but not clear enough
"satisfactory"	3	Explanation of the process of solving a situational problem is insufficiently complete, inconsistent, with errors, weak theoretical justification, with significant difficulties and errors in schematic images and visual demonstrations, answers to additional questions are not clear enough, with errors in details
"unsatisfactory"	2	The explanation of the process of solving a situational problem is given incompletely, inconsistently, with gross errors, without theoretical justification, without the ability to provide schematic images and visual demonstrations or with a large number of errors, answers to additional questions are incorrect or missing

2.5. Examples of demonstration of practical skills

ID-3 OPK-5.3, ID-1 OPK-10.1

1. Type of preparation - section, smear, film preparation, total preparation;
2. Drug name;
3. Staining of histological specimen;
4. Type of organ structure – parenchymal, tubular, mixed;
5. Tissue composition of the organ and its main parts;
6. Identify on the specimen and describe the main histological structures.

When describing a parenchymal organ it is necessary:

1. at low magnification

- give a description of the organ, indicating that the parenchymal organ has a lobular, zonal, bundle structure;
- indicate the tissue composition of the parenchyma and stroma;
  2. at high magnification
- indicate which structures are characteristic of parenchyma;
- give a detailed description of the microscopic structure of these structures;
- be able to identify and show them on the preparation.

When describing a tubular organ it is necessary:

1. Indicate that the organ has a layered structure;
2. Arrange the preparation so that the inner surface of the organ is located in the upper part of the field of vision, and the outer surface is located below. When describing a structure, move sequentially from the inner shell to the outer shell;

3. At low magnification

- describe the relief of the organ,
- name and show shells.

4. At high magnification

- indicate the tissue layers included in the shells,
- indicate which structures are characteristic of each shell,
- be able to find these structures on the preparation and describe them.

Evaluation criteria, scale for demonstrating practical skills

Rating		Description
"excellent"	5	Knows all the educational material, understands it perfectly and has thoroughly mastered it. Gives correct, conscious and confident answers to questions (within the program). In oral answers he uses literary correct language and does not make mistakes.
"good"	4	Knows all the required educational material, understands it well and has mastered it firmly. Answers questions (within the program) without difficulty. In oral answers he uses literary language and does not make gross mistakes
"satisfactory"	3	Knows basic educational material. Answers questions (within the limits of the program) with difficulty. In oral answers, he makes mistakes when presenting the material and in constructing his speech.
"unsatisfactory"	2	Does not know most of the educational material, answers, as a rule, only to the teacher's leading questions, hesitantly. Makes frequent and serious mistakes in oral answers

2.6. Tasks on histological specimen:

ID-3 OPK-5.3, ID-1 OPK-10.1

1. Spinal ganglion (connective tissue membrane, anterior and posterior roots, layers of loose fibrous connective tissue, pseudounipolar neurons, nerve fibers, mantle cells, oligodendrogliocytes, fibrocytes).
2. Spinal cord (central canal, gray matter: anterior, lateral, posterior horns, interneurons, motor neurons, white matter).
3. Cerebellum (gray matter: molecular layer, ganglion layer, granular layer; pyriform neuron with branching processes, white matter).

Evaluation criteria, grading scale for tasks on histological preparations

Rating		Description
"excellent"	5	Completed in full – 90%-100%
"good"	4	Not fully implemented – 80%-89%
"satisfactory"	3	Completed with deviation – 70%-79%
"unsatisfactory"	2	Partially completed – 69% or less correct answers

3. Current control procedure

Current monitoring of progress in the discipline is carried out in the form of: completing test tasks (testing, interviews, solving situational problems), demonstrating practical skills and diagnosing histological preparations.

4. Examples of assessment tools and assessment criteria for intermediate certification

4.1. Sample checklist of questions to prepare for the exam:

ID-3 OPK-5.3, ID-1 OPK-10.1

1. The concept of fabrics, their classification. The theory of tissue evolution by A.A. Zavarzin and N.G. Khlopin. Tissue as a system of interacting cellular differons.
2. Structural and functional elements of tissues: cells, intercellular substance, postcellular structures, symplasts. Development and regeneration of tissues. The concept of physiological and reparative tissue regeneration.
3. Epithelial tissues. Morphofunctional characteristics and classification. Features of integumentary, glandular and sensory epithelia. Morphological characteristics of epithelium. The concept of the basement membrane and intercellular contacts.
4. Morphological and histogenetic classification of epithelial tissues.
5. Glandular epithelia. Structure and histophysiology of glands. Secretory cycle. Classification of glands. Merocrine, apocrine and holocrine types of secretion. The concept of exo- and endocrine glands.

Evaluation criteria, assessment scale for control questions

Rating		Description
"excellent"	5	Knows all the educational material, understands it perfectly and has thoroughly mastered it. Gives correct, conscious and confident answers to questions (within the program). In oral answers he uses literary correct language and does not make mistakes.
"good"	4	Knows all the required educational material, understands it well and has mastered it firmly. Answers questions (within the program) without difficulty. In oral answers he uses literary language and does not make gross mistakes
"satisfactory"	3	Knows basic educational material. Answers questions (within the limits of the program) with difficulty. In oral answers, he makes mistakes when presenting the material and in constructing his speech.
"unsatisfactory"	2	Does not know most of the educational material, answers, as a rule, only to the teacher's leading questions, hesitantly. Makes frequent and serious mistakes in oral answers

4.2. Examples of demonstration of practical skills:

ID-3 OPK-5.3, ID-1 OPK-10.1

1. Spinal ganglion (connective tissue membrane, anterior and posterior roots, layers of loose fibrous connective tissue, pseudounipolar neurons, nerve fibers, mantle cells, oligodendrogliocytes, fibrocytes).
2. Spinal cord (central canal, gray matter: anterior, lateral, posterior horns, interneurons, motor neurons, white matter).
3. Cerebellum (gray matter: molecular layer, ganglion layer, granular layer; pyriform neuron with branching processes, white matter).

Evaluation criteria, scale for demonstrating practical skills

Rating		**Description**
"excellent"	5	Knows all the educational material, understands it perfectly and has thoroughly mastered it. Gives correct, conscious and confident answers to questions (within the program). In oral answers he uses literary correct language and does not make mistakes.
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"unsatisfactory"	2	Does not know most of the educational material, answers, as a rule, only to the teacher’s leading questions, hesitantly. Makes frequent and serious mistakes in oral answers

4.3. Examples of situational tasks:

ID-3 OPK-5.3, ID-1 OPK-10.1

Task. The histological specimen reveals an organ with a lobular structure. Each lobule has a cortex and medulla. The parenchyma of the lobules is formed by lymphoid tissue, which contains T-lymphocytes at different stages of proliferation and differentiation. The microenvironment is represented by epithelioreticular cells. Hassall's corpuscles are detected in the medulla. What organ has this histological structure?

Quests:

1. Name the sources of organ development.
2. List the tissue composition of the organ.
3. Characterize the morphofunctional features of the organ.
4. Characterize the leading cellular differon.
5. Evaluate the regenerative capabilities of the organ.

Evaluation criteria, rating scale for situational tasks

Rating		**Description**
"excellent"	5	Explanation of the process of solving a situational problem is detailed, consistent, competent, with theoretical justifications, with the necessary schematic images and visual demonstrations, with correct and fluent use of terminology; answers to additional

		questions are correct and clear
"good"	4	Explanation of the process of solving a situational problem is detailed, but not logical enough, with isolated errors in details, some difficulties in theoretical justification, schematic images and visual demonstrations, answers to additional questions are correct, but not clear enough
"satisfactory"	3	Explanation of the process of solving a situational problem is insufficiently complete, inconsistent, with errors, weak theoretical justification, with significant difficulties and errors in schematic images and visual demonstrations, answers to additional questions are not clear enough, with errors in details
"unsatisfactory"	2	The explanation of the process of solving a situational problem is given incompletely, inconsistently, with gross errors, without theoretical justification, without the ability to provide schematic images and visual demonstrations or with a large number of errors, answers to additional questions are incorrect or missing

Evaluation criteria, final grading scale

Rating		**Description**
"excellent"	5	The student answered the theoretical question(s) correctly. Demonstrated excellent knowledge of the training material. Completed the practical task(s) correctly. Demonstrated excellent skills and proficiency in applying acquired knowledge and skills when solving problems within the framework of the educational material. Answered all additional questions
"good"	4	The student answered the theoretical question(s) with minor inaccuracies. Demonstrated good knowledge of the training material. Completed the practical task(s) with minor inaccuracies. Demonstrated good skills and proficiency in applying acquired knowledge and skills when solving problems within the framework of the educational material. Answered most additional questions
"satisfactory"	3	The student answered the theoretical question(s) with significant inaccuracies. Demonstrated satisfactory knowledge of the course material. Completed the practical task(s) with significant inaccuracies. Demonstrated satisfactory skills and abilities to apply the acquired knowledge and skills when solving problems within the framework of the educational material. Made many inaccuracies when answering additional questions
"unsatisfactory"	2	The student, when answering the theoretical question(s) and performing the practical task(s), demonstrated an insufficient level of knowledge and skills in solving problems within the educational material. There were many incorrect answers when answering additional questions.

5. Intermediate assessment procedure

Intermediate assessment in the discipline is carried out in the form of an exam. The exam includes: an interview on control questions, an assessment of the demonstration of practical skills, and solving situational problems.