PRIVATE HIGHER EDUCATIONAL INSTITUTION
"INTERNATIONAL ACADEMY OF ECOLOGY AND MEDICINE"
Department of Fundamental Disciplines

WORKING PROGRAM OF EDUCATIONAL DISCIPLINE

"Histology, cytology and embiology"

LEVEL OF HIGHER EDUCATION Second (master's) level
DEGREE OF HIGHER EDUCATION Master's degree
BRANCH OF KNOWLEDGE 22 Healthcare
SPECIALTY 222 Medicine

Reviewed and approved
at the meeting of the Academic Council
dated August 21, 2016

Kyiv 2016

Working program of education discipline Histology, cytology and embriology for the preparation of students **of higher** education of the second (master's) level of higher education in specialty 222 Medicine.

INTRODUCTION

The program of the discipline " Histology, cytology and embryology " is composed according to the educational-professional program for training specialists of the second (master's) level of specialty 222 Medicine, field of knowledge 22 Health care, the Law of Ukraine "On Higher Education" from 01.07.2014 № 1556-VII (Article 13, item 7), the provision "On the organization of the educational process in the PHEE" International Academy of Ecology and Medicine ", methodological recommendations approved by the Central Methodical Cabinet of Higher Medical Education of the Ministry of Health of Ukraine on curriculum development standards of higher education. The discipline "Histology, cytology and embryology " belongs to the section of the General preparation of the curriculum for the preparation of higher education applicants of the second educational (master's) level.

Description of the academic discipline (abstract)

<table>
<tr><th>Name of indicators</th><th>Field of knowledge, direction of training, educational and qualification level</th><th colspan="2">Characteristics of the academic discipline</th></tr>
<tr><td rowspan="2">Credits – 11,5</td><td rowspan="2">Branch of knowledge:
22 "Health care"</td><td colspan="2">Full course</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td rowspan="2">Modules - 2
Content sections - 6</td><td rowspan="2">Specialty
222 "Medicine"</td><td colspan="2">A year of training</td></tr>
<tr><td colspan="2">I, II</td></tr>
<tr><td rowspan="2">The total number of hours is
345 hours</td><td rowspan="2">Level of higher education:
master's degree</td><td colspan="2">Semesters</td></tr>
<tr><td colspan="2">II, III</td></tr>
<tr><td rowspan="4"></td><td rowspan="3">Form of education :
daytime</td><td>Lectures</td><td>40 hours</td></tr>
<tr><td>Practical</td><td>130 hours</td></tr>
<tr><td>S.S.</td><td>175 hours</td></tr>
<tr><td rowspan="2">Type of discipline:
mandatory</td><td colspan="2">Type of control:</td></tr>
<tr><td colspan="2">Current and final, exam.</td></tr>
</table>

The subject of study of the discipline is the microscopic and ultramicroscopic structure of cells, tissues and organs of the human body, their development and changes in various conditions of life.

Interdisciplinary links: Histology, cytology and embryology is based on the study of medical biology, anatomy and integrated with these disciplines; lays the foundations for students to study physiology, biochemistry, pathological anatomy and pathological physiology, propaedeutics of clinical disciplines, which involves the integration of teaching with these disciplines and the formation of skills to apply knowledge of histology, cytology and embryology in further study and professional activities.

PURPOSE AND TASK OF THE DISCIPLINE

1. **The purpose** of teaching the discipline "Histology, cytology and embryology" consistent with objectives of the educational-professional training program for applicants for the second educational (master's) level of higher education and are determined by the content of those systemic knowledge and skills that must be mastered by a doctor. The knowledge that students receive from the discipline "Histology, cytology and embryology" is basic for the block of disciplines that provide scientific and professional training.
   The purpose of the course "Histology, Cytology and Embryology" is to study the microscopic and ultramicroscopic structure of structures of the human body, their development and changes in various conditions of life.

2. **The main tasks** of studying the discipline "Histology, cytology and embryology" are:
   - Study the molecular and structural bases of cell function and repair and their derivatives
   - Study the basics of adapting, reacting and maintaining homeostasis
   - Determination of adaptation and regenerative capacity of organs taking into account their tissue composition, features of regulation and age changes
   - Interpretation of patterns of human embryonic development, regulation of morphogenesis processes
   - Determination of critical periods of embryogenesis, defects and human developmental abnormalities.

3. **Competencies and learning outcomes**, which promotes the formation of discipline (relationship with the normative content of training seekers of higher education, formulated in terms of learning outcomes in Standard).

Matrix of competencies

№	Compe-tence	Knowledge	Skills	Communication	Autonomy and responsibility
	2	3	4	5	6
	Integrated competencies				
	Ability to solve typical and complex specialized problems and practical problems in a professional health care activity, or in a learning process that involves research and / or innovation and is characterized by complexity and uncertainty of conditions and requirements.				
	General competencies				
1	Ability to apply knowledge in practical situations	To have specialized conceptual knowledge acquired in the learning process.	To be able to solve complex problems and problems that arise in professional activities.	Clear and unambiguous communication of own conclusions, knowledge and explanations that substantiate them to specialists and non-specialists.	Responsibility for decisions in difficult conditions
2	Knowledge and understanding of the subject area and understanding of the	To have deep knowledge of the structure of professional activity.	To be able to carry out professional activities that require updating and integration of knowledge.	Ability to effectively form a communication strategy in professional activities	Responsibility for professional development, ability to further professional training with a high

	profession				level of autonomy.
3	Ability to exercise self-regulation, lead a healthy lifestyle, ability to adapt and act in a new situation.	To know ways of self-regulation, leading a healthy life.	To be able to apply the means of self-regulation, be able to lead a healthy lifestyle and adapt to new situations (circumstances) of life and activity.	To establish appropriate connections to achieve results.	Responsibility for a healthy lifestyle and timely use of self-regulation methods.
4	Ability to choose a communication strategy; ability to work in a team; interpersonal skills	To know the tactics and strategies of communication, laws and ways of communicative behavior	To be able to choose ways and strategies of communication to ensure effective teamwork.	To use communication strategies and interpersonal skills.	Responsibility for the choice and tactics of communication
5	Ability to communicate in the native language both orally and in writing; ability to communicate in another language	To have a perfect knowledge of the native language and basic knowledge of a foreign language.	To be able to apply knowledge of the native language, both orally and in writing, be able to communicate in a foreign language.	To use the native language in professional and business communication and in the preparation of documents; use a foreign language in a professional activities.	Responsibility for fluency in the native language, for the development of professional knowledge.
6	Skills in the use of information and communication technologies	To have deep knowledge in the field of information and communication technologies used in professional activities.	To be able to use information and communication technologies in a professional field that requires updating and integration of knowledge.	To use information and communication technologies in professional activities.	Responsibility for the development of professional knowledge and skills.
7	Ability to abstract thinking, analysis and synthesis, the ability to learn and be modernly trained.	To know the methods of analysis, synthesis and further modern learning.	To be able to analyze information, make informed decisions, be able to acquire modern knowledge.	To establish appropriate connections to achieve goals.	Responsibility for the timely acquisition of modern knowledge.
8	Ability to evaluate and ensure the quality of work performed.	To know the methods of evaluating performance indicators.	To be able to ensure quality work.	To establish connections to ensure quality work.	To be responsible for the quality of work.

9	Determination and perseverance are persistent in the tasks and responsibilities	To know the responsibilities and ways to perform the tasks.	To be able to set goals and objectives to be persistent and conscientious in the performance of duties.	To establish interpersonal relationships to effectively perform tasks and responsibilities.	To bt responsible for the quality of the tasks
10	The ability to act socially in accordance with public consciousness	To know your social and community rights and responsibilities.	To form one's civic consciousness, to be able to act in accordance with it.	Ability to convey one's public and social position.	To be responsible for your civic position and activities
11	The desire to preserve the environment.	To know the problems of environmental protection and ways to preserve it.	Be able to form requirements for themselves and others to preserve the environment.	To make proposals to the relevant authorities and institutions on measures to preserve and protect the environment.	To be responsible on the implementation of environmental protection measures within its competence.
	Special competencies				
12	Ability to evaluate the results of laboratory and instrumental research	To know a) the shape and structure of the organs integrated into the system; b) histological structure of organs, vessels, nerves in different parts of the body, which is of great importance for diagnosis; c) aspects of histological features individual human development at different stages of ontogenesis; d) patterns of prenatal and early postnatal development of human organs.	To be able: - to demonstrate and describe the histological structure of organs, systems of human organs; -to determine by histological preparations organs; - to assess the impact of social conditions and labor on the development and structure of the organism; -to apply Latin anatomical terms and their Ukrainian equivalents in accordance with the requirements of the international anatomical nomenclature; - to be able to analyze the results of laboratory and instrumental studies of organs and systems.	It is reasonable to evaluate the results of the study of the histological structure of human organs, combined into body systems, the relationship of organs and systems, the impact of social conditions and work on the development and structure of the organism.	Responsibility for decision-making on the evaluation of the results of the study of the histological structure of human organs.

According to with requirements educational and professional programs students should:

know:

- histological, cytological and embryological denominations in English;
- basic cellular architectures and their functional specializations;
- major tissue compatibility system;
- processes: the cell cycle, cell proliferation, differentiation and aging, apoptosis and necrosis

and their importance for the functioning of the organism;
- ways of solving typical and complex specialized tasks and practical problems in science that provide research and / or implementation of innovations and are characterized by complexity and uncertainty of conditions and requirements;
- mechanism of aging of the organism;
- asic computer and biostatistical tools used in medicine, including medical databases, spreadsheets and basics of computer graphics;
- the effects of oxidative stress on cells and its importance in the pathogenesis of diseases and in aging processes;
- ways of communication between cells and between the cell and the extracellular matrix and signal transduction pathways in the cell, as well as examples of disorders in these processes leading to the development of cancer and other diseases;
- microarchitecture of tissues, extracellular matrix and organs;

be able:
- recognize histological structures (in relation to cellular structures of tissues, cells and organs) on optical and electron microscopy images, and accurately describe and interpret their structure and the relationship between structure and function;
- application of knowledge of histology, cytology and embryology in practical situations;
- understanding of the subject area of histology, cytology and embryology;
- stages of development of the human embryo, the structure and function of the membranes and placenta;
- use basic laboratory techniques, such as qualitative analysis, titration, colorimetry, pHmetry, chromatography;
- stages of development of individual organs and the influence of harmful factors on the development of the embryo and fetus;
- handle an optical microscope, including immersion option;
- use anatomical, histological and embryological terms efficiently and precisely in speech and writing;
- electrophoresis of proteins and nucleic acids;
- selection of communication strategies; ability to work in a team; interpersonal interaction skills;
- operate simple measuring instruments and evaluate the accuracy of the measurements performed;
- use databases, including online databases, and search for needed information using available tools;
- communicating in the native language in speech and writing; ability to communicate in a foreign language;
- plan and perform a simple scientific study and interpret its results and draw conclusions;
- use of information and communication technologies;
- abstract thinking, analysis and synthesis;
- evaluation and quality assurance of work.

is ready to:
- capable of evaluating laboratory results;
- see and understand one's own limits, as well as self-assess educational deficiencies and requirements;
- use objective sources of information;
- formulate conclusions based on their own measurements or observations;

- establish viewpoints on many areas of professional practice;
- accept responsibility for judgments made in the course of their professional duties, especially those concerning their own and others' safety;
- implement the principles of professional comradeship and cooperation in a team of specialists, including with representatives of other medical professions, including in a multicultural and multinational environment to multinational environment;
- acceptance of responsibility related to decisions made in the framework of professional activities, including in terms of the safety of themselves and others;
- execute the values of professional camaraderie and cooperation in a team of professionals, including members from other medical professions, in a multicultural and global context.

2. CONTENS OF EDUCATIONAL DISCIPLINE.

345 hours of 11.5 ECTS credits are allocated for the study of the academic discipline,
incl. lectures 40 hours, practical classes 130 hours, independent work 175 hours. Normative discipline.

The program is structured in modules and submodules:

Module 1. Cytology, general histology and embryology.
Submodule 1. Cytology.
Submodule 2. Embryology.
Submodule module 3. General histology.

Module 2. Special histology and embryology.
Submodule module 4. Histology and embryology of regulatory and sensory systems.
Submodule module 5. Histology and embryology of internal organs.
Submodule module 6. Histology and embryology of reproductive system.

Module 1. Cytology, general histology and embryology.
Specific goals: to interpret molecular and structural bases of functioning and restoration of cells and their derivatives, to interpret structural bases of adaptation, reactivity and homeostasis maintenance, to interpret patterns of human embryonic development, regulation of human morphogenesis, determine critical embryogenesis periods, embryogenesis.

Submodule 1. Cytology.
Specific goals:
- To determine histological elements and their structural components by light and electron microscopy
- To determine cell life cycle phases, ability of cells to proliferate, restore and function by structural parameters and expression of genes and corresponding molecules
- To interpret functional specialization (differentiation) and cellular status by structure and molecular markers
- To identify markers and morphological manifestations of cell proliferation, differentiation, adaptation, senescence and death.

Submodule 2. Embryology.
Specific goals:
- To interpret regularities of the basic stages of embryogenesis.
- To interpret patterns of human embryonic development.

- To identify critical periods of embryogenesis, defects in human development.

Submodule 3. General histology.

Specific goals:

- To interpret the concept of "tissue".
- To draw conclusions about the role of general tissues in the structure of different organs.
- To analyze age characteristics of common tissues.
- To interpret the embryonic and post-embryonic development of common tissues.
- To evaluate the physiological and reparative regeneration of common tissues.

Module 2. Special histology and embryology.

Specific goals:

To determine the adaptation and regenerative capacity of organs, taking into account their tissue composition, peculiarities of regulation and age-related changes, interpret the structural bases of human reproduction, interpret the structural and molecular bases of regenerative medicine.

Submodule module 4. Histology and embryology of regulatory and sensory systems.

Specific goals:

- To draw conclusions about the role of special tissues in the structure of different organs.
- To analyze age-specific features of special fabrics.
- To interpret the embryonic and post-embryonic development of special tissues.
- To evaluate the physiological and reparative regeneration of special tissues
- To explain the concepts of organs, morphological and functional systems.
- To interpret the features of the microscopic structure of the hollow and parenchymal organs.
- To interpret the structure of different organs of the human body in the aspect of the interrelations of the tissues that make up their composition at different ages, as well as in the conditions of physiological and reparative regeneration.

Submodule module 5. Histology and embryology of internal organs.

Specific goals:

- To explain the concepts of organs, morphological and functional systems.
- To interpret the features of the microscopic structure of the hollow and parenchymal organs.
- To interpret the structure of different organs of the human body in the aspect of the interrelations of the tissues that make up their composition at different ages, as well as in the conditions of physiological and reparative regeneration.

Submodule module 6. Histology and embryology of reproductive system.

Specific goals:

- To interpret embryonic and post-embryonic development of genital tissues.
- To assess the physiological and reparative regeneration of the genitals
- To explain the concept of genitals, morphological and functional systems.
- To interpret the features of the microscopic structure of the genitals.
- To interpret the structure of the human genital organs in the aspect of the interrelations of the tissues that make up their composition at different ages, as well as in the conditions of physiological and reparative regeneration.

3. THE STRUCTURE OF EDUCATIONAL DISCIPLINE.

Names of modules, submodules and topics	Number of hours		
	Lectuers	Practice – no classes	SRS
1	2	3	4
MODULE 1. Cytology, embryology and general histology.			
Submodule 1. Cytology.			
Microscope. Microscopic devices. Histological technique. Aim and tasks of Histology.	-	2	3
Cytology. General organization of cell. Plasmalemma. Cell junctions.	2	2	3
Structure of cytoplasm. Membranous organelles.	-	2	3
Nonmembranous organelles and inclusion.	-	2	3
Cell nucleus.	-	2	3
Cells division. Cell cycle. Aging and death of cell.	-	2	3
Submodule 2. Embryology.			
General embryology and gametogenesis.	2	2	3
Fertilization. Implantation. Formation of extra-embryonic organs.	-	2	3
Early stages of development of embryo.	-	2	3
Provisional organs. Placenta. Umbilical cord.	-	2	3
Submodules 1, 2 control.	-	2	3
Submodule 3. General histology.			
Basic principles of organization of tissues. Epithelium tissues.	2	2	3
Blood. Erythrocytes and platelets. Hemogram.	2	2	3
Leukocytes. Leukocytic formula.	-	2	3
Myeloid and lymphoid tissues. Hematopoiesis and lymphopoiesis.	-	2	3
Loose connective tissue.	-	2	3
Dense connective tissue. Specialized connective tissue.	2	2	3
Cartilage tissues. Structure and development.	2	2	3
Bone tissues. Structure. Joints of bones. Development of bones.	2	2	3
Muscles tissues. Structure and development.	2	2	3
Nervous tissue. Neurons end neuroglia.	-	2	3
Nervous tissue. Nerve fibers and nerve endings. Regeneration of nerve fibers.	2	2	3
Submodule 3 control.	-	2	3
Control of practical skills from module 1.	-	2	3
Final test control of the module 1.	-	2	3
Total for module 1	**18**	**50**	**75**
MODULE 2. Special histology and embryology.			
Submodule 4. Special histology and embryology of regulatory and sensory systems.			

Cardiovascular system. Heart.	2	2	2
Arteries. Veins.	-	2	2
Structure of microvasculature. Lymphatic vessels.	-	2	2
Organs of hematopoiesis and immune defense. Bone marrow. Thymus.	-	2	3
Spleen. Lymph nodes. Palatine tonsils.	-	2	3
Immune defense system.	-	2	3
Endocrine system. Hypothalamus. Epiphysis.	2	2	3
Hypophysis. Hypothalamo-hypophyseal system.	-	2	3
Thyroid gland. Parathyroid glands.	-	2	3
Suprarenal gland. APUD System.	-	2	3
Nervous system. Brain. Cerebellum.	2	2	3
Spinal cord. Peripheral nervous system.	-	2	3
Vegetative nervous system. Reflex arc.	-	2	3
Sense organs. Eyes.	2	2	3
Sense organs. Auditory and vestidular organs.	-	2	3
Taste organ. Organ olfactoria.	-	2	3
Skin and its derivatives.	-	2	3
Submodule 4 control.	-	2	2
Submodule module 5. Histology and embryology of internal organs.			
Digestive system. Organs of oral cavity.	2	4	3
Tooth structure.	-	2	3
Tooth development.	-	2	3
Esophagus. Stomach.	2	2	3
Small and large intestine.	-	4	3
Salivary glands.	2	2	3
Liver. Pancreas.	-	4	3
Organs of respiratory system.	2	4	3
Urinari system. Kidneys. Urinary tract.	2	4	3
Submodule 5 control.	-	2	3
Submodule 6. Hhistology and embryology of reproductive system.			
Male reproductive system.	2	2	3
Female reproductive system. Ovaries. Oogenesis.	2	2	3
Uterus. Mammary gland.	-	2	3
Menstrual cycle.	-	2	3
Submodule 6 control.	-	2	3
Control of practical skills from module 2.	-	2	3
Final test control of the module 2.	-	2	2
Total for module 2	**22**	**80**	**100**
Total hours per course	**40**	**130**	**175**

4.THEMATIC PLAN OF LECTURES

	The 1st course	

	The 2nd semester	
№	Theme	Number of hours
	Module 1. Cytology, embryology and general histology.	2
1.	**Introduction to the course of histology, cytology and embryology.** History of science development.	2
2.	General and comparative embryology.	2
3.	Introduction to the doctrine of tissue. Epithelial tissues.	2
4.	**Blood and lymph.**	2
5.	Hemopoiesis.	2
6.	Connective tissues.	2
7.	Bone and cartilage tissues.	2
8.	Muscle tissue.	2
9.	Nervous tissue.	2
	Module 2. Special histology and embryology.	
10.	Cardiovascular system.	2
	Total	**20**

The 2nd course
The 3rd semester

№	Theme	Number of hours
1.	Endocrine system.	2
2.	Nervous system.	2
3.	Sensory organssensory organs.	2
4.	Organs of oral cavity.	2
5.	Digestive tube.	2
6.	Digestive glands.	2
7.	Respiratory system.	2
8.	Urinary system.	2

9.	Male reproductive system.	2
10.	Female reproductive system.	2
Total:		**20**

5. THEMATIC PLAN OF PRACTICAL CLASSES

	The 1st course The 2nd semester	
№	Theme	Number of hours
	MODULE 1. Cytology, embryology and general histology.	
	Submodule 1. Cytology.	
1	Microscope. Microscopic devices. Histological technique. Aim and tasks of Histology.	2
2	Cytology. General organization of cell. Plasmalemma. Cell junctions.	2
3	Structure of cytoplasm. Membranous organelles.	2
4	Nonmembranous organelles and inclusion.	2
5	Cell nucleus.	2
6	Cells division. Cell cycle. Aging and death of cell.	2
	Submodule 2. Embryology.	
7	General embryology and gametogenesis.	2
8	Fertilization. Implantation. Formation of extra-embryonic organs.	2
9	Early stages of development of embryo.	2
10	Provisional organs. Placenta. Umbilical cord.	2
11	Submodule 2 control.	2
	Submodule 3. General histology.	
12	Basic principles of organization of tissues. Epithelium tissues.	2
13	Blood. Erythrocytes and platelets.Hemogram.	2
14	Leukocytes. Leukocytic formula.	2
15	Myeloid and lymphoid tissues. Hematopoiesis and lymphopoiesis.	2
16	Loose connective tissue.	2
17	Dense connective tissue. Specialized connective tissue.	2
18	Cartilage tissues. Structure and development.	2
19	Bone tissues. Structure. Joints of bones. Development of bones.	2
20	Muscles tissues. Structure and development.	2
21	Nervous tissue. Neurons end neuroglia.	2
22	Nervous tissue. Nerve fibers and nerve endings. Regeneration of nerve fibers.	2
23	Submodule 3 control.	2
24	Control of practical skills from module 1.	2
25	Final test control of the module 1.	2
	MODULE 2. Special histology and embryology.	
	Submodule 4. Special histology and embryology of regulatory and sensory	

	systems.	
26	Cardiovascular system. Heart.	2
27	Arteries. Veins.	2
28	Structure of microvasculature. Lymphatic vessels.	2
29	Organs of hematopoiesis and immune defense. Bone marrow. Thymus.	2
30	Spleen. Lymph nodes. Palatine tonsils.	2
31	Immune defense system.	2
32	Endocrine system. Hypothalamus. Epiphysis.	2
33	Hypophysis. Hypothalamo-hypophyseal system.	2
34	Thyroid gland. Parathyroid glands.	2
35	Diff.credit	2
	Total	**70**
	The 2nd course **The 3rd semester**	
№	Theme	Amount of hours
1	Suprarenal gland. APUD System.	2
2	Nervous system. Brain. Cerebellum.	2
3	Spinal cord. Peripheral nervous system.	2
4	Vegetative nervous system. Reflex arc.	2
5	Sense organs. Eyes.	2
6	Sense organs. Auditory and vestidular organs.	2
7	Taste organ. Organ olfactoria.	2
8	Skin and its derivatives.	2
9	Submodule 4 control.	2
	Submodule module 5. Histology and embryology of internal organs.	
10	Digestive system. Organs of oral cavity.	2
11	Tooth structure.	2
12	Tooth development.	2
13	Esophagus. Stomach.	2
14	Small intestine.	2
15	Large intestine.	2
16	Salivary glands.	2
17	Liver.	2
18	Pancreas.	2
19	Organs of respiratory system 1.	2
20	Organs of respiratory system 2.	2
21	Urinari system. Kidneys.	2
22	Urinary tract.	2
23	Submodule 5 control.	2
	Submodule 6. Hhistology and embryology of reproductive system.	
24	Male reproductive system.	2
25	Female reproductive system. Ovaries. Oogenesis.	2

26	Uterus. Mammary gland.	2
27	Menstrual cycle.	2
28	Submodule 6 control.	2
29	Control of practical skills from module 2.	2
30	Final test control of the module 2.	2
	Total	**60**

Plan of students individual work

1. Prepare a review of the scientific literature on the topics being studied.
2. Prepare a summary of research on the topics being studied .
3. Writing essays on the following topics:

Module 1.

1. The relationship of histology, cytology and embryology with other biomedical Sciences.
2. The emergence of histology, cytology and embryology as a science.
3. Histology in Ukraine. The history of the Department of histology, Cytology and embryology of the UMS.
4. Microscope. Microscopic devices. Histological technique.
5. Methods of investigation in histology.
6. The response of cells to external stimuli.
7. Nuclear apparatus of cells.
8. Aging and death of cells.
9. Pathology of mitosis.
10. General embryology. The embryonic development of chordates, lower and higher vertebrates.
11. Extra germinal organs.
12. The system "mother – fetus".
13. Critical periods of embryo development.
14. General principles of organization of tissues.
15. Stem cells.
16. The lymph. Lymphoablative.
17. Hemoglobin. Structure and types of hemoglobin.
18. Regulation of hematopoiesis.
19. The concept of macrophage system of the body.
20. Intracellular substance of connective tissue.
21. The biosynthesis of collagen.
22. Ultrascreen the structure of elastic fibers.
23. The regeneration of cartilage tissue.
24. Bone as an organ. Histological structure of the joints.
25. Histological structure of bones as the body.
26. Restructuring of the bones. Factors influencing bone structure.
27. Regeneration of bone tissue.
28. Muscle as an organ. Regeneration of muscles.
29. Nerve endings. Their classification and structure.
30. Regeneration of nerve fibers.

Module 2.

1. The development of the nervous system.

2. The regeneration of nerves.
3. The brain stem.
4. Age-related changes of the nervous system.
5. The development of the eye.
6. Auxiliary apparatus of the eye.
7. The development of the ear.
8. The development of the olfactory organ.
9. Age-related changes in the senses.
10. Derivatives of the skin.
11. Age-related changes in the skin.
12. The development of the cardiovascular system.
13. Embryonic hematopoiesis.
14. Characterization of immunoglobulins.
15. The mechanisms of integration of elements of the immune system.
16. Morphofunctional characteristic of the lymphatic system.
17. Features of the structure of the blood vessels.
18. Hemolymphatic nodes.
19. The dissociated endocrine system.
20. Morphological and functional characteristics of the gastrointestinal endocrinocytes .
21. The development of oral cavity and digestive system.
22. Lymphoepithelial ring of Pirogov.
23. Morphological and functional characteristics of salivary glands.
24. Age-related changes in the tissues of the tooth.
25. Processes of digestion and absorption in the small intestine.
26. Morphological characteristics of the vermiform Appendix.
27. The blood supply of the nephron.
28. The endocrine system of the kidneys.
29. Features of development of male and female sexual systems.
30. Endocrine function of male and female genital systems.

THE LIST OF THEORETICAL QUESTIONS FOR PREPARATION OF STUDENTS FOR THE FINAL MODULAR CONTROL

CYTOLOGY AND EMBRYOLOGY

1. Cells. General plan of its structure.
2. Plasmalemma. General plan of a structure. Classification and functions of membrane proteins.
3. Connections and contacts between adjoining cells. Classification.
4. Cytoplasma. The basic components, functions. Hyaloplasma.
5. Organelles. Classification. General characteristic of membranous organelles.
6. Non-membranous organelles. Their general characteristic.
7. Special organelles. Classification. Inclusions. Classification, Morphofunctional characteristic.
8. Interaction of cell's structures during metabolism (by the example of protein synthesis).
9. Nucleus. Structure, functions. Value of a nucleus for ability to live of cells.
10. Kariolemma. Morphofunctional characteristic. Nuclear pore, structure, functions.
11. Chromatine as the basic carrier of the hereditary information. Classification, structure.
12. Nucleola. Morphofunctional characteristic and role in ability to live of cells.
13. Life cycle of cells. Its stages, characteristic. Cell cycle. Characteristic of phases.
14. Mitosis. Its stages and Morphofunctional characteristic.

15. Meiosis as type of cell fission. Its basic differences from mitosis.
16. Amitotic division as type of cell fission. The comparative characteristic of mitotic and amitotic division.
17. Stages of development of the human body. Stages of embryogenesis, their characteristic.
18. Gametes. Structure, functions, differences from somatic cells. Spermatogenesis. Its stages and regulation.
19. Ovogenesis. Its stages and regulation. Female reproductive cellular complex. Structure and functions of its components.
20. Comparative characteristic of spermato- and ovogenesis.
21. Fertilisation. Distant stage, contact stage of fertilisation. Synkarion. The factors providing these stages.
22. Segmentation. Its biological value. Characteristic such as segmentation at a human germ.
23. Blastocyst: morphological characteristic of components. Their value for germ and provisional organs formation. Changes of a germ during segmentation. Terms in embryogenesis.
24. Implantation, stages. Human germ during implantation. The morphological characteristic.
25. Gastrulation. General characteristic. Mechanisms, terms.
26. Neurulation. Mechanisms, terms. Segmentation of the mesoderm. The mechanism, terms.
27. Provisional organs and shalls. Morphofunctional characteristic.
28. Structure of the fetal eggs' wall. Its features in the field of a placentary platform.
29. Yolk sac. Alantois.
30. Umbilical cord. Its structure.
31. Placenta. Its structure, functions.
32. Structure-functional unit of a placenta - kotiledon.
33. Haemo-placentic barrier and its value in system the mother - child.
34. Human placenta. Type, morphofunctional characteristic. Endocrine function of placenta.
35. Structure of the structure-functional units of the placenta. Concept about primary and secondary villies.
36. Amnionic shall. Its formation and value for development of a germ.
37. Chorionic shall. Its formation and value for development of a germ.
38. Decidua. Its formation and value for development of a germ. Parts of decidua. Their functional value.
39. Polyfetal pregnancy, the reasons, possible consequences.
40. Critical periods of human development. Their value for an organism.

GENERAL HISTOLOGY

1. Tissues as one of levels of the alive matter's organization. Definition, principles of a structure. Modern classification of tissues. General characteristic. Stem cells, their properties.
2. Cells and intercellular substance. Symplasts, syncitia. Intercellular substance: fibrillar component, ground subbstance, their structure and functions. Classification of fibres.
3. Epithelial tissue. Morphofunctional characteristic. Classification. The basic attributes and properties of epithelia.
4. Simple epithelia. Classification, Morphofunctional characteristic. Localization in the human body.
5. Stratified nonkeratinazed epithelium. Structure. Features of regeneration.
6. Stratified keratinazed epithelium. Structure. Processes of epitheliocytes' differentiations. Keratinization.
7. Transitional epithelium. Morphofunctional characteristic. Features of a structure in different functional conditions.
8. Glands. Classification. Morphofunctional characteristic. Types of the end-pieces and ducts.

9. Secretory cycle of the glands. Phases, its cytophysiological characteristic. Types of secretion.
10. Blood. Morphofunctional characteristic. Cellular structure of blood. Functions of cells.
11. Stem blood cells. Its general characteristic. Modern theories of haemocytopoiesis.
12. Erythrocytopoiesis, its stages. Retikulocytes.
13. Thrombocytopoiesis. Morphological characteristic of the megakariocytes.
14. Granulocytopoiesis.
15. Monocytopoiesis.
16. Haemogramma. Its clinical value.
17. Erythrocytes. Morphofunctional characteristic. Hemoglobin, its chemical compound. Types of hemoglobin.
18. Thrombocytes. Morphofunctional characteristic.
19. Leukocytes. Classification, general characteristic. Their functional value.
20. Leucocytic formula, itsclinical value.
21. Granulocytes. Their types. Amount, sizes, shapes, structure, functions, life expectancy.
22. Lymphocytes. Types. Subpopulations T-and B-лимфоцитов. Concept about lymphocytes' differentiation.
23. Monocytes. Subpopulations. Concept about macrophageal system of the body.
24. General characteristic of connective tissue. Classification. A dense fibrous connective tissue. Sources of development. Cellular elements and intercellular substance.
25. Areolar fibrous connective tissue. Morphofunctional characteristic. Cellular structure.
26. Connective tissues with special properties. Cellular structure, localization in an organism, functions.
27. General characteristic and features of the organization of skeletal tissues. Cartilages. Classification. Cells and intercellular substance. Formation of the cartilage tissue.
28. Bone tissue. Classification. Cells and intercellular substance. Osteon. Cortical and trabecular bone. Physiological and reperative regeneration of the bone.
29. Osteogenesis. Intramembranous bone formation, its stages. Endochondral osteogenesis. Its stages.
30. Concept about immunity system. Classification and characteristic immunocytes.
31. Interaction of immunocytes in cellular and humoral immunity.
32. Cooperation of blood cells and connective tissue in immunity answer.
33. Muscle tissue. Morphofunctional characteristic. Classifications. Sources of development. Structural bases of muscular contraction.
34. Smooth muscle tissue. Structure and functions of smooth muscle cells.
35. Skeletal muscle tissue. Histogenesis, structure. Ultrastructure of sarcomer. Role of myosatelitocytes in regeneration of muscle tissue.
36. Cardiac muscle. Structure. Characteristicof cardiomyocytes.
37. Nervous tissue. Morphofunctional characteristic. Histogenesis. Classification of neurocytes. Ultrastructural characteristic. Special organelles.
38. Glial cells. Classification. Macroglia. Microglia. Structure and functions of cells.
39. Nervous endings. Classification. A structure of synapses, receptors and effectors.
40. Nervous fibers. Structurally and functional characteristic. Regeneration of nervous fibers.

SPECIAL HISTOLOGY

1. Nervous system. General morphofunctional characteristic and morphological classification. A peripheral nerve. Structure and regeneration.
2. Spinal cord. A structure of grey and white mater. Spinal ganglia, their structure and functions.
3. General morphofunctional characteristic of the large hemispheres of the brain. Cytoarchytectonics. Myeloarchytectonics.
4. Cerebellum. Structure and functional characteristic. Cytoarchytectonics. Myeloarchytectonics.

5. Cardiovascular system. General morphofunctional characteristic. Classification of blood vessels.
6. General plan of the blood vessels wall's structure, haemodynamic conditions. Arteries. Viens.
7. Arterioles, capillaries, vienules. Morphofunctional characteristic. Structure of the different type capillares. Histohaematic barriers.
8. Heart. Morphofunctional characteristic. A structure of the heart's wall.
9. Sense organs. A general characteristic. Classification of sense organs. Organ olfactoria.
10. Optical organ. Morphofunctional characteristic. Functional apparates of an eye. Retina: structure, functions.
11. Taste organ. Morphofunctional characteristic. Cytologic characteristic.
12. Audiovestibular organ. Morphofunctional characteristic. Structure of the Corti organ. Vestibular organ.
13. Endocrine system. Classification of the endocrine glands. Concept about receptors to hormones and targets-cells.
14. Hypothalamus. Nucleuses. Neurosecretory cells, axo-vasal synapses.
15. Hypophysis. Morphofunctional characteristic. Cellular structure. Features of blood supply of the hypophysis.
16. Thyroid gland. Morphofunctional characteristic. Cellular structure. Parathyroid glands.
17. Suprarenal glands. Structure of the cortex and medulla.
18. Alimentary system. A general plan of the digestive tube's structure and classification of glands. Oral cavity. General characteristic of the oral mucousa.
19. Tongue: structure and functions. Tongue's papillae: classification, Gustatory bands.
20. Teeth. General principles of the structure. Micromorphology of enamel, dentine and cement.
21. Teeth. Histomorphology of the pulp and periodontium.
22. Characteristic of stages of teeth's development.
23. Major salivary glands. Features of the structure. Micromorphology of secretory departments and duct's system.
24. Esophagus. Morphofunctional characteristic. Features of the structural organization of its departments. Glands: a structure, functions.
25. Stomach. Morphofunctional characteristic. Histophysiology of the glands, their cellular content, functions.
26. Small intestine. Morphofunctional characteristic. Cellular structure and structure of the mucousa. Large intestine.
27. Pancreas. Morphofunctional characteristic. Structure and functions of exoccrine and endocrine parts. Cellular structure of the pancreatic island, functions of different types insulocytes.
28. Hepar. Morphofunctional characteristic. Structure of hepatocytes. Structure of classic and portal lobes, acinuses.
29. Central and peripheral organs of haemopoiesis and immunogenesis. Morphofunctional characteristic. Classification. Bone marrow. Haemopoietic, stromal and vascular components.
30. Thymus: structure of the cortex and medulla. Haemato-thymic barrier, its structure and functions. Endocrine function of thymus.
31. Spleen: a structure and functions of a red pulp. Features of blood supply. White pulp.
32. Lymph node: a structure and functions. Differentiation of the lymphocytes in a lymph node.
33. Respiratory system. General plan of it structure. Structure and functions of the trachea and bronches of different calibre.
34. Lungs. Morphofunctional characteristic. Respiratory and non-respiratory departments. Structure and functions of acini. Alveolocytes. Surfactant. Aero-haematic barrier.
35. Skin. Structure and functions of epidermis. Keratinization and regeneration. Structure of the dermis and hypodermis.

36. Skin glands. Classification and structure. Structural and functional features of nails and hair.
37. Urinary system. General plan of of it organization. Functions. Sources of development and stages of embryogenesis. Nephron: types and cytophysiology. Urinary tract.
38. Male reproductive system. General characteristic. Development. Testis: structure, functions. General characteristic of the male reproductive tract. Additional male glands.
39. Female reproductive system. Development. Morphofunctional characteristic. Structure of the ovaries. Exocrine and endocrine functions.
40. Uterus. Morphofunctional characteristic. Mammary glands. Features of its structure during lactation. Hormonal regulation.

TEACHING METHODS

1. Verbal (lecture, explanation, story, conversation, instruction);
2. Visual (observation, illustration, demonstration);
3. Practical (different types of exercises, graphic works, experiment, practice).

The training process uses the following teaching methods:

- explanatory-illustrative or informational-receptive, which provides for the ready presentation of information by the teacher and its assimilation by students;
- reproductive, which is based on the performance of various types of tasks on the sample;
- method of a problem statement - the teacher puts the problem and he solves it, demonstrating the contradictions that characterize the process of cognition, the task of students is to monitor the sequence of presentation, evidence of materiality, the prediction of the next steps of the teacher; the MN is implemented by teaching students to problem situations to ensure successful preliminary preparation for upcoming work in real conditions of practical medical institutions;
- partially search or heuristic, aims at the mastery of the separate elements of search activity, for example: the teacher formulates the problem, students hypothesis;
- research, the essence of which is to organize teacher search creative activity of students by setting new problems and problem tasks.
- methods to ensure the perception and assimilation of knowledge by students (lectures, independent work, instruction, consultation);
- methods of application of knowledge and acquisition and consolidation of skills (practical sessions, assignments);
- methods of verification and assessment of knowledge and skills.

CONTROL METHODS

Current control is performed based on the control of theoretical knowledge, skills and abilities in practical classes. Independent study students are assessed in practical classes, and is an integral part of the final grade of the student. Current control is performed during the training sessions and aims at checking the assimilation of students learning the material. Forms of current control are:

a) test tasks with a choice of one correct answer, with the definition of the correct sequence of actions, with determination of the conformity, defining the specific portion of the photo or diagram ("detection");
b) individual oral questioning, interview;
c) the solution of typical situational tasks;
g) identification of pathogens and carriers of pathogens of parasitic diseases in the photographs, macro - and micropreparats;
d) control of practical skills;
e) the typical problems of Histology, cytology and embryology.

Form of final control of education is carried out in the form of the exam (written, oral) (second semester). The semester examination is a form of final control of mastering by the student the theoretical and practical material of the discipline. The final control (exam) is held on the last control class.

To FC allowed students who attended all included in the curriculum for the discipline of classroom training and the study module scored points not less than the minimum (72 points). A student who for good or without good reason, had the missing classes, you are allowed to work on academic debt to a fixed term.

The form of the final control should be standardized and include control of theoretical and practical training.

SCHEME OF CALCULATION AND DISTRIBUTION OF POINTS RECEIVED BY APPLICANTS FOR HIGHER EDUCATION.

Evaluation of current educational activities. During the assessment of mastering each topic for the current educational activity of the student scores are set on a 4-point (national) assessment scale. This takes into account all types of work provided by the discipline program. The student must receive a score on each topic. Scores on the traditional scale are converted into points. The final assessment of the current academic activity is the arithmetic mean (the sum of scores for each lesson is divided by the number of lessons per semester) and translated into points according to Table 1.

The study of the discipline ends with a final control in the form of a differential assessment. Only those students who do not have academic debt (all missed classes have been completed) and whose average score for the current educational activity in the academic discipline is at least "3" are admitted to the differential credit.

The maximum number of points that a student can score for the current educational activity for admission to the exam is 120 points and is defined as the sum of the arithmetic average of all grades received in the semester.

The minimum number of points that a student must score for the current educational activity for admission to the exam is 72 points. Recalculation of the average grade for the current academic performance (on a 120-point scale) in the table. 1.

Calculating of the number of points is based on obtained marks of student according to traditional scale while learning subject during the semester, by calculating the arithmetic mean (AM) that is rounded to two signs after comma.

Table 1. Conversion of the average score for the current activity into a multi-scale scale (for disciplines completed by credit)

4- point scale	200- point scale	4- point scale	200- point scale	4- point scale	200- point scale	4- point scale	200- point scale
5	200	4,47	179	3,94	158	3,42	137
4,97	199	4,45	178	3,92	157	3,4	136
4,95	198	4,42	177	3,89	156	3,37	135
4,92	197	4,4	176	3,87	155	3,35	134
4,9	196	4,37	175	3,84	154	3,32	133
4,87	195	4,35	174	3,82	153	3,3	132
4,85	194	4,32	173	3,79	152	3,27	131
4,82	193	4,3	172	3,77	151	3,25	130
4,8	192	4,27	171	3,74	150	3,22	129
4,77	191	4,24	170	3,72	149	3,2	128
4,75	190	4,22	169	3,7	148	3,17	127
4,72	189	4,19	168	3,67	147	3,15	126
4,7	188	4,17	167	3,65	146	3,12	125
4,67	187	4,14	166	3,62	145	3,1	124
4,65	186	4,12	165	3,6	144	3,07	123
4,62	185	4,09	164	3,57	143	3,05	122
4,6	184	4,07	163	3,55	142	3,02	121
4,57	183	4,04	162	3,52	141	3	120
4,55	182	4,02	161	3,5	140	<3	Not

4,52	181	3,99	160	3,47	139		enough
4,5	180	3,97	159	3,45	138		

Evaluation of individual student tasks. Points for individual tasks are accrued only if they are successfully completed and defended. The number of points awarded for different types of individual tasks depends on their scope and significance, but not more than 10-12 points. They are added to the amount of points gained by the student in the classroom during the current educational activity. In no case may the total amount for current activities exceed 120 points.

Evaluation of independent work of students. Independent work of students, which is provided by the topic of the lesson together with the classroom work, is evaluated during the current control of the topic in the relevant lesson. Assimilation of topics that are submitted only for independent work is checked during the final module control.

Evaluation of final control.

The maximum number of points that a student can score during the exam is **80 points**.

The final control is considered credited if the student scored at least 60% of the maximum amount of points (for a 200-point scale - at least **50 points**).

Determining the number of points that a student scored in the discipline: the number of points that a student scored in the discipline is defined as the sum of points for the current academic activity and for the final control (exam).

Conversion of the number of points from the discipline into grades on the ECTS scale and on a four-point (traditional) scale

Scores from disciplines are independently converted into both the ECTS scale and the national assessment scale, but not vice versa. **Table 2**.

Table 2. Conversion of the average score for the current activity into a multi-point scale (for disciplines completed by exam)

4- point scale	120- point scale	4- point scale	120- point scale	4- point scale	120- point scale	4- point scale	120- point scale
5	120	4,45	107	3,91	94	3,37	81
4,95	119	4,41	106	3,87	93	3,33	80
4,91	118	4,37	105	3,83	92	3,29	79
4,87	117	4,33	104	3,79	91	3,25	78
4,83	116	4,29	103	3,74	90	3,2	77
4,79	115	4,25	102	3,7	89	3,16	76
4,75	114	4,2	101	3,66	88	3,12	75
4,7	113	4,16	100	3,62	87	3,08	74
4,66	112	4,12	99	3,58	86	3,04	73
4,62	111	4,08	98	3,54	85	3	72
4,58	110	4,04	97	3,49	84	<3	Not enough
4,54	109	3,99	96	3,45	83		
4,5	108	3,95	95	3,41	82		

Criteria for establishing the assessment on the traditional 4-point and ECTS scale after passing the exam:

Points by the multi-point (200) scale	Grade by the 4-point scale (National assessment scale)	Score ECTS
180-200	5	A
160-179		B
150-159	4	C
130-149	3	D
120-129		E
50-119		FX
0-49	2	F

The criteria for the evaluation.

During assessment of the assimilation of each topic for current educational activities of e applicant higher education grades are given on a national scale (traditional) scale with egard to the approved evaluation criteria:

- *"excellent" (5)*- student flawlessly learned the theoretical material of the topic, demonstrates deep and comprehensive knowledge of the relevant topics, the main provisions of scientific sources and recommended literature, to think logically and builds a response, freely use the acquired theoretical knowledge in the analysis of practical material, expresses his attitude to certain issues, demonstrates a high level of mastering of practical skills;

- *"good" rating (4)* - the student has well learned the theoretical material of the lesson has the basic aspects of primary sources and recommended literature, convincingly expounds it; possesses practical skills and expressed their concerns about certain problems, but it is assumed certain inaccuracies and errors in the logic of presentation of theoretical content or performing practical skills.

- *"satisfactory" (3)* - the student has basically mastered the theoretical knowledge training topics, versed in the primary sources and recommended literature, but unconvincing answers, confuses, additional issues are the student's uncertainty or lack of stable knowledge; answering questions of a practical nature, reveals inaccuracies in knowledge, does not know how to evaluate facts and phenomena linked with the future activity, allows for errors in the performance of practical skills;

- *"unsatisfactory" (2)* the student has not mastered the learning material of the topic, knows scientific facts, definitions, is almost oriented in the primary sources and recommended literature, no scientific thinking, practical skills are not formed.

Exhibited on the traditional scale are converted in points. The minimum number of points that need to recruit a student for current educational activity per semester for admission to the exam is 120 points.

METODICAL SUPPLY

1. Working curriculum for the discipline.
2. Calendar-thematic plans of lectures and practical classes.
3. Materials of preparation for practical classes.
4. Methodical instructions for practical classes.
5. Test tasks, situational tasks, constructive tasks and micropreparations.
6. Microscopes and video systems for the study of histological specimens.
7. Training tables.
8. Test tasks for the state license exam "Krok-1. General medical training" in Histology, Cytology and embriology. For independent work of students specialty 222 "Medicine". Electronic edition (issued annually with updates, in Ukrainian, Russian and English).

RECOMMENDED LITERATURE

The main (basic)

1. Mescher A.L. Junqueiras basic histology.Text and atlas. 13 th. Ed. New York, Mack Graw Hill, 2013. –559 p.
2. Moore K.L. Persaud T.V.N. The developing human: Clinically oriented embryology. 8 th ed. –Philadelphia, Saunders Elsevier, 2008. –493 p.
3. Ovalle W.K., Nahirney P.C. Netters essential histology. –Philadelphia, Saunders Elsevier, 2008. -493 p.
4. Ed. E.F.Barynova, Yu.B.Chaykovskoho. Cytology and general embryology. Tutorial. Kyiv, NE "Medicine", 2010.- 216 p.
5. Ed. E.F.Barynova, Yu.B.Chaykovskoho. Special histology and embryology internal organs. Tutorial. Kyiv, NE "Medicine", 2013.- 471 p.

Support

1. Sadler TV Medical Embryology at Lanhmanom. Lviv, "Nautilus", 2001.- 550S.
2. Kierszenbaum A.L., Tres L.L. Histology and Cell Biology.- Elsevier, Philadelphia, 2012.- 701 p.
3. Ross M.H., Pawlina W. Histology. A Text and Atlas.- Wolters Kluwer, Philadelphia, 2011.- 974 p.
4. Young B., Lowe J.S., Stevens A., Heath J.W. Wheathers functional histology: A text and colour atlas. 5 th ed. –Philadelphia, Churchill Livingstone Elsevier, 2010. -473p.

Approved:

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