Ministry of Education and Science of Ukraine
V. N. Karazin Kharkiv National University

FUNDAMENTALS OF CYTOLOGY

Methodical guidance
for the 1st academic year students of the School of Medicine

Electronic resource

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Fundamentals of cytology : methodical guidance for the 1st academic year students of
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Methodical guidance contains basic recommendations for preparing first-year medical students for classes and exams in the elective discipline “Fundamentals of Cytology”. Developed for applicants for higher medical education in higher medical educational institutions of Ukraine III-IV accreditation levels: higher educational level Second (Master of Medicine), field of knowledge “22 Healthcare”, specialty “222 Medicine”, qualification “Doctor”.

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CONTENTS

GENERAL DESCRIPTION OF THE «FUNDAMENTALS OF CYTOLOGY» DISCIPLINE

The discipline "Fundamentals of Cytology" occupies a very important place in the educational program of the Faculty of Medicine, as it studies the microscopic and ultramicroscopic structure of cells, tissues, and organs and provides the acquisition of basic knowledge necessary for the successful study of special medical disciplines.

The purpose of the academic discipline "Fundamentals of Cytology" is to provide students with knowledge of the microscopic and ultramicroscopic structure and function of human cells and their derivatives. Mastering this course provides the basic knowledge necessary for the successful study of special medical disciplines.

Interdisciplinary connections: «Fundamentals of Cytology» as an educational discipline based on students' study of medical biology, anatomy and integrates with these disciplines; provides the basis for students to study pathological anatomy and propaedeutics of clinical disciplines, which involves the integration of teaching with these disciplines and the formation of the ability to apply knowledge of cytology in the process of further education, as well as in professional activities.

According to the Standard of higher education in the specialty 222 Medicine, the study of the discipline "Fundamentals of Cytology", in combination with other components of the educational and professional program, ensures that students of higher education acquire the following competencies:

General:

- Ability to think abstractly, to analyze and synthetize; ability to learn and master modern knowledge. (GC 01).
- Ability to apply knowledge in practical situations (GC 02).
- Knowing and understanding the subject area and understanding the professional activities (GC 03).
- Ability to adapt and to act properly in new situations (GC 04).

- Ability to make an informed decision; work in a team; interpersonal skills (GC 05).
- Skills in using information and communication technologies. (GC 06).
- Skills in the use of information and communication technologies; ability to search, process and analyze information from various sources (GC 07).
- Definiteness and persistence in relation to the tasks that were set and the responsibilities that were taken (GC 08).
- Ability to act socially responsibly and consciously (GC 09).
- Ability to use information and communication technologies (GC 10).
- Ability to search, process and analyze information from various sources (GC 11).
- The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle (GC 15).
- The ability to make decisions and act in accordance with the principle of inadmissibility of corruption and any other manifestations of dishonesty (GC 16).

Professional:

- Ability to collect medical information about the patient and analyze clinical data (PC 1).
- Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results (PC 2).
- Ability to determine the principle and nature of treatment and prevention of diseases. (PC 6).

- The ability to assess the impact of the environment, socio-economic and biological determinants on the state of health of an individual, family, population (PC 17).
- Adherence to professional and academic integrity, to be responsible for the reliability of the obtained scientific results (PC 25).

According to the National Qualifications Framework and the educational and professional program of V. N. Karazin Kharkiv National University School of Medicine, applicants who have completed the educational course "Fundamentals of Cytology", must to:

- Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy (PLO 1).
- Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care (PLO 2).
- Specialized conceptual knowledge, which includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of the problem in the field of medicine and related interdisciplinary problems, including the system of early intervention (PLO 3).
- To search for the necessary information in the professional literature and databases of other sources, analyze, evaluate and apply this information (PLO 21).
- To apply modern digital technologies, specialized software, statistical methods of data analysis to solve complex healthcare problems. (PLO 22).

TEACHING METHODS

Several classical and modern pedagogical approaches are used in teaching the discipline:

1. «Teacher-centered approach» or «direct instruction model» — conveying information to higher education students through lectures and instruction on learning.

2. «Student-centered approach» and «personalized learning», namely students'considerable freedom and independence in choosing topics for individual tasks and expressing their own opinions during its implementation.

3. «High-tech approach», namely the use of Web technologies to support access of students to the materials of the discipline, communication with the teacher and communication with other participants in the educational process.

4. Differentiated approach to methods of memorizing information, for in process of studying the material, students use both passive (reading and taking MCQ tests, viewing the presentations and videos) and active (answering the provided questions for self-check or control tests with written answers) methods of memorization.

THEMATIC PLAN OF THE DISCIPLINE

Characteristics of the educational discipline

Elective discipline	
Full-time education	
Year	1st
Semester	2nd
Lectures	–
Practical classes	30 hours
Independent work	60 hours

Thematic plan of the educational discipline «Fundamentals of Cytology»

Topic 1. History of cytology and histology. Methods of histological and cytological research. The emergence of cytology as an independent science.

Formation of cytology and histology as independent sciences. The significance of works by R. Hooke, A. Leuenghuka, J. Purkinje, R. Brown, M.

Schliden for the cell theory creation. T. Schwann's researches. The cell theory as a fundamental generalization in biology. Clarification of the microscopic structure of tissues and organs, creation of the tissue classification.

Development of histology, cytology and embryology in Ukraine. Organization of independent departments (P.I. Peremezhko, N.L. Khrzhnchevsky). Significance of M.K. Kulchytsky, V.Ya. Rubashkina, V.V. Alyoshina, M.I. Zazibina, M.F. Kashchenko, B.I. Khvatov researches.

The contemporary state of cytology. The relation of cytology with other medical and biological sciences.

Topic 2. Microscope. Light and electron microscopy.

The major principles of making a preparation for light and electron microscopy, obtaining of the material (biopsy, needle puncture biopsy, autopsy). Fixation, dehydration, paraffin processing, section preparation using microtome and ultramicrotome. The types of preparations – thin slices, smear, stamp, lamina, splits. Staining and contrasting of histological samples. The concept of histological stains.

The microscopy technique in light microscopes. Special methods of light microscopy - phase-contrast, dark-field, fluorescent, interferential, laser scanning. Transmission and scanning electron microscopy. The principles of histochemistry, radioavtography, immunocytochemistry. Live cell research methods. Quantitative methods of research - morphometry, densitometry, cytophotometry, spectrofluorometry.

Topic 3. Modern representations about the structure of biological membranes. General organization of the cell. Non-cellular structures of the human body.

The concept of a cell as an elementary living system. Eukaryotic cell - as a basis for the structure, function, reproduction, development, adaptation and rehabilitation of multicellular organisms. Derivative cells as components of multicellular organisms' tissues.

The aim and tasks of cytology, its significance for medicine. The basic principles of the cellular theory at the contemporary stage of the science development.

The general plan of the eukaryotic cell structure. The interaction of structure and size of the cells and their functional specialization in the organism of animals and human.

Contemporary vision of biological membranes. Fluid mosaic model of the biomembrane structure.

Plasma membrane, epiplasmalemmal and subplasmalemmal components, their structural, chemical and functional characteristics.

Topic 4: General characteristics of the structure and functions of the cytolemma.

Modern concept of biological membranes. Cluster-mosaic model of biomembrane structure. Cytolema, supramembrane and submembrane components, their structural, chemical and functional characteristics.

Topic 5: Transport and receptor functions of plasmolemma. Intercellular junctions.

Transmembrane transport of substances. Diffusion, passive and active transport. Endo- and exocytosis. Parietal digestion. Receptory functions of plasma membrane. Micrivilli. cilia, brush border, basal invagination. Intercellular contacts, their types, structure and function, intercellular interactions.

Topic 6. General characteristics of the structure and functions of the intercellular matrix.

Intercellular matrix: composition and functional significance. Adhesion of cells. General ideas about the structure and mechanism of action of adhesive proteins.

Topic 7. The cell cytoplasm. Hyaloplasm, membranous organelles.

The major components of cytoplasm -hyaloplasm, organelles. inclusions.

Hyaloplasm - definition, cytosol and cytometrics, physical and chemical features, chemical composition, the significance for cellular metabolism.

Organelles - definition, classification. Organelles of general and special purpose. Membranous organelles (granular and agranular endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes, mitochondria).

Topic 8. Nonmembranous oganelles. Inclusions.

Nonmembranous organelles (ribosomes, centrioles, microtubules, microfilaments and intermediate filaments). Synthetic processes in the cell. Interaction of structural components of the cells during the protein and non-protein substance synthesis.

Inclusion - definition, classification, meaning.

Topic 9. Structural organization of nucleus. Nucleolus. The nuclear envelope membranes.

The significance of the nucleus for the vital functions of the eukaryotic cell, preserving and passing of genetic information. Shape, size, quantity of nuclei, nucleo-cytoplasmical ratio in various types of cells. The major components of the nucleus: nuclear envelope, chromatin, nucleolus, karyoplasm.

The nuclear envelope, its structure and functions. The nuclear envelope membranes, perinuclear space, nuclear pores.

Nucleolus is a derivative of chromosomes. Nuclear organizers. The nucleolus structure and its role in the formation of ribosomes.

Karyoplasm, physical and chemical features, chemical composition, significance in the nucleus functions.

Topic 10. Chromatin and chromosomes. Euchromatin and heterochromatin. Transport processes between the nucleus and cytoplasm.

Chromatin Structure and chemical composition. Euchromatin and heterochromatin. Sex chromatin. Chromatin as a form of chromosome existence in the interphase nucleus. Composition of chromosomes: DNA, RNA, histone and non-histone proteins. Structure and function of chromosomes during cell division. Karyotype, polyploidy.

Topic 11. Cell division and differentiation. General characteristics of the stages of mitosis. Cell aging and cell death.

Life and cell cycle, their characteristics. Cells with different types of the cell cycles.

Mitosis. Biological significance. Phases of mitosis. Reorganization of structural components of the cell during different phases of mitosis. Endomitosis. Polyploidy. Intracellular regeneration.

Topic 12: General characteristics of the meiosis process.

Patterns of reproduction of reproductive cells of the human body. Meiosis. Biological significance. Phases of meiosis. Reorganization of structural components of the cell during different phases of meiosis.

Topic 13. Factors on which the functioning of the cells of the human body depends. Aging and cell death.

Reactions of cells to a damaging effect. Reversible and irreversible cell changes, their morphological manifestations. Adaptation of cells, its importance for preserving the life of cells in changed conditions of existence. Aging and cell death. Apoptosis and its biological and medical significance.

Topic 14. Modern methods of cell research.

Modern methods of cell research. The place of cytological studies in the system of clinical laboratory diagnostics. Cellular technologies in medicine.

INDEPENDENT WORK

1 - providing written answers to control questions;

2 - drawing diagrams and specimens, labling diagrams;

3 - tasks of distance courses: work with Web-resources on the topic, execution of graphic notes, performance testing tasks of closed and open type, including illustrated tests, which demonstrate the microscopic structure of human cells and tissue.

Type 1 tasks (written answers to control questions) are usually part of the homework and performed by a student during preparation for practical class.

Type 2 - 3 tasks can be a component of homework or performed by a student directly in practical classes (specific type of work is determined by the teacher).

Completion of tasks for independent work is obligatory. A student of higher education can receive a grade for a subject only if all tasks for independent work are completed.

Name of topic

Microscopic methods: vital and post-vital. Histochemical methods of cell and tissue research. The concept of an artifact.

Modern types of light microscopy.

General organization of the cell. Biomembranes, plasma membrane. Cytoplasm.

Types of cell populations. Non-cellular structures.

Cytolemma, glycocalyx, submembrane layer. Transport functions of the cytolemma: endocytosis and exocytosis.

Intercellular contacts. Structure and functions.

Cytoplasm: Cytosol, organelles, inclusions. Modern ideas about the biological significance of the presence of a system of membrane compartments in the cell.

Non-membrane organelles. General plan of the structure, functional properties.

General ideas about the components of the cytoskeleton: microtubules, actin and intermediate filaments. Centrioles and Microtubule-Organizing Centers.

Membrane organelles. Endoplasmic reticulum, peroxisomes, mitochondria. Endosimbiosis as a possible pathway for the occurrence of membrane organella. Golgi apparatus and its role in intracellular vesicular transport. Lysosomes.

Nucleus. Nuclear functions. Morphology, chromatin. Nuclear envelope and nucleoplasm. Chromatin and chromosomes. Euchromatin and heterochromatin. The structure of nucleosomes. The role of histone proteins in the functioning of chromatin. Nucleolus. Modern ideas about the structure and mechanism of functioning.

Cell cycle, interphase, mitosis. Modern ideas about the regulation of the cell

cycle. Mitosis, general characteristics.

Meiosis, general characteristics.

Features of meiosis as a process of division of germ cells.

Regulation of cell activity. General characteristics of apoptosis and necrosis.

Preparation for the final control in the discipline «Fundamentals of Cytology»

CONTROL METHODS

To determine the level of formation of knowledge and skills in the educational discipline "Fundamentals of Cytology", written and oral control is provided.

Written control is carried out in the form of test tasks of various types (closed and open-form tests, illustrated tests, including interactive test tasks of the Moodle distance learning system with automated verification).

Oral control in the form of an interview is carried out after the student of higher education has completed all educational activities by topic/subject to determine the level of formation of knowledge of theoretical content and practical skills.

Control of practical skills during testing and interviewing is implemented on the basis of assessing the ability of higher education students to work with a microscope, diagnose and analyze histological specimens and electronic microphotographs that reflect the microscopic structure of human cells and tissues. The control of practical skills makes it possible to find out to what extent the student has realized the theoretical foundations of these actions.

According to the curriculum of the discipline «Fundamentals of cytology» the department defines the following stages of control: current control (control of mastering the topic) and final control (credit).

Current control determines the degree of achievement by applicants of higher education of the planned results of the study of the relevant topic in the

discipline «Fundamentals of cytology» and is carried out at each practical lesson during the semester.

The final semester control (credit) determines the degree to which higher education applicants have achieved the planned learning outcomes determined by the work program of the academic discipline, and is carried out at the last practical session of the semester as a check of the level of knowledge formation and skills acquired in the process of studying the educational discipline «Fundamentals of cytology».

Examples of test tasks for current control in the discipline "Fundamentals of Cytology"

1. Electron microscopic study of a cell revealed roundish bubbles confined by a membrane and containing a lot of various hydrolytic enzymes. It is known that these organelles provide intracellular digestion and protective functions. These elements are:

a. Lysosomes

b. Centrosomes

c. Endoplasmic reticulum

d. Ribosomes

e. Mitochondria

2. A 45-year-old woman had her tooth extracted. The tissue regenerated. Which of the following organelles are the most active during tissue regeneration?

a. Ribosomes

b. Centrosomes

c. Mitochondria

d. Agranular endoplasmic reticulum

e. Lysosomes

3. Formation of ribosome subunits in a cell was disturbed in course of an experiment (by means of activated mutagenic factors). This will have an effect on the following metabolic process:

a. Protein biosynthesis

b. Carbohydrate biosynthesis

c. ATP synthesis

d. Photosynthesis

e. Biological oxidation

4. What are the folds on the inner mitochondrial membrane called?

a. Plasmalemma

b. Glycocalyx

c. Protoplasm

d. Cristae

e. Ground substance

5. Which organelle is involved in lipid metabolism?

a. Rough endoplasmic reticulum

b. Smooth endoplasmic reticulum

c. Lysosome

d. Golgi apparatus

e. Mitochondria

6. Which organelle contains detoxifying enzymes?

a. Ribosomes

b. Peroxisome

c. Microfilaments

d. Centrioles

e. Nucleoli

7. Which of the following is NOT a membranous organelle?

a. Microtubules

b. Lysosomes

c. Peroxisomes

d. Mitochondria

e. Endoplasmic reticulum

8. What is the limiting membrane of a cell?

a. Plasmalemma

b. Glycocalyx

c. Protoplasm

d. Cristae

e. Ground substance

9. What is also called a low resistance junction?

a. Tight junction

b. Gap junction

c. Junctional epithelium

d. Junctional complex

e. None of the above

10. Which of the following is an organelle?

a. Pigment

b. Glycogen

c. Lipid

d. Secretory granules

e. Mitochondria

11. What is the term for the general process that cells us to bring things into the cell?

a. Endocytosis

b. Exocytosis

c. Pinocytosis

d. Phagocytosis

e. Active transport

12. Which organelle produces protein for export?

a. Rough endoplasmic reticulum

b. Smooth endoplasmic reticulum

c. Lysosome

d. Golgi apparatus

e. Mitochondria

13. Which one of the following transport processes requires energy?

a. Active transport

b. Passive transport

c. Facilitated diffusion

d. Simple diffusion

e. Filtration

14. The synthesis of histone proteins was artificially blocked in a cell. What structure of the cell will be damaged?

a. Nuclear chromatin

b. Nucleolus

c. Golgi Complex

d. Cellular envelope

e. Nuclear envelope

15. The electronic photomicrography shows the round structure by size 15-20 nm consisting of big and small subunits. It is known that this organella provides the protein synthesis. Indicate it.

a. Microtubule.

b. Centrosome.

c. Peroxisome .

d. Ribosome.

e. Mitohondria

SCORING SCHEME

Current control of educational activities of the applicant for higher education

Current control is carried out at each practical lesson as a check of the level of formation:

- knowledge of the theoretical content of the topic being studied (test form of control, 50% of the total score),

- compulsory skills and abilities (interview to determine the level of practical skills, 50% of the total assessment).

Control of mastering the topic. Written testing on the topic is conducted in every class. The test task for the current control consists of 15 tests of the closed type and necessarily contains the questions from the base of the state licensing examination KROK-1. The time required to complete the test task is 1 minute per question (15 minutes).

According to the test results an interview is conducted.

Grades of the current academic performance of higher education students are calculated according to the traditional (four-point) scale.

The grade "5" (excellent) is given to a student, who:

1. Completed homework (answered the questions in the Workbook concerning the topic).

2. During the testing, correctly answered 14-15 questions from 15.

3. Finished the practical class record (drawn specimens and diagrams in the Workbook to the topic).

4. Correctly answered 95-100% of the teacher's questions, using specimens and electron micrographs which are discussed at the practical class.

5. Demonstrated a high level of practical skills.

The grade "4" (good) is given to a student, who:

1. Completed homework (answered the questions in the Workbook concerning the topic).

2. During the testing, correctly answered 12-13 questions from 15.

3. Finished the practical class record (drawn specimens and diagrams in the Workbook on the topic).

4. Correctly answered 80-90% of the teacher's questions, using specimens and electron micrographs which are discussed at the practical class.

5. Demonstrated a sufficient level of practical skills.

The grade "3" (satisfactory) is given to a student, who:

1. Completed homework (answered the questions in the Workbook concerning the topic).

2. During the testing, correctly answered 10-11 questions from 15.

3. Finished the practical class record (drawn specimens and diagrams in the Workbook on the topic).

4. Correctly answered 70-80% of the teacher's questions, using specimens and electron micrographs which are discussed at the practical class.

5. Demonstrated a satisfactory level of practical skills.

The grade "2" (unsatisfactory) is given to a student, who:

1. Did NOT do his homework (did NOT answer the questions in the Workbook concerning the topic).

2. During the test correctly answered LESS, than 10 questions from 15

3. Did NOT finish the record of the practical class (did NOT draw specimens and diagrams in the Workbook on the topic).

4. Did NOT answer more than 70% of the teacher's questions.

5. Demonstrated a low level of practical skills.

The final control is carried out at the last practical lesson in the semester as a check of the level of formation:

- knowledge of the theoretical content of the discipline «Fundamentals of cytology» (test form of control, 50% of the total score),

- compulsor skills and abilities (interview interview with determination of the level of practical skills, 50% of the total assessment).

The testing task for the final control consists of 45 tests of the closed type and necessarily contains questions from the base of the state licensing examination KROK-1. The time required to complete the test task is 1 minute per 1 question (45 minutes).

After the test, the applicant of higher education passes an interview and demonstrates practical skills.

Lists of questions for the test in the discipline "Fundamentals of Cytology", histological preparations and electron micrographs:

The list of questions for credit in the discipline

«Fundamentals of cytology»

1. Microscope. Microscopic devices. Methods of cyto-histological research.
2. Electron microscope. The principle of operation of the electron microscope.
3. Determination of the cell as a structural unit of living.
4. Cell theory. The main provisions of T. Schwann's cellular theory.
5. Modern cellular theory. Main provisions.
6. General organization of the cell.
7. Morphofunctional characteristic of non-cellular structures of the body.
8. Give the structural characteristics of cell membranes in accordance with the fluid-mosaic model of the membrane structure.
9. Types of cellular contacts and their characteristics.
10. Transport of substances through plasmolema. Phagocytosis. Pinocytosis.
11. Plasmalema. Morphofunctional characteristic.
12. Morphofunctional characteristics of hyaloplasma.
13. Morphofunctional characteristics of membrane organelles.
14. Specify the types of endoplasmic reticulum, their structure and functional value.
15. Describe the structure and functions of the Golgi complex.
16. Name the lysosome and peroxisome components, their functional value.
17. List the structural components and functions of the mitochondria.
18. Morphofunctional characteristic of non-membrane organelles.
19. Describe the structure of the ribosome.
20. Describe the structures of the cytoskelet and specify their values.
21. Inclusion. Classification. Characteristics of certain types of inclusions.
22. Morphofunctional characteristics of the cell nucleus.
23. The structure of Nuclear membrane. The structure of the nuclear pore.

24. Describe "heterochromatin" and "euhromatin".

25. Describe the structure and functions of the nucleolus.

26. Cell cycle. Characteristic.

27. List the ways of cell reproduction, their values.

28. Characteristics of mitosis as a process of cell reproduction.

29.Characteristics of meiosis as a process of cell reproduction.

30. Cell aging and death. Necrosis and apoptosis.

The list of histological specimens that student must be able to diagnose.

1. Mitosis of plant cells.

2. Tigroid in the nerve cells of the spinal ganglion.

3. Inclusion of pigment in the pigmentocytes of the cardiovascular membrane of the eye.

4. Inclusion of glycogen in liver cells.

5. Lipid inclusions in brown adipose tissue cells.

6. Lipid inclusions in white adipose tissue cells.

7. Heterochromatin nucleus of neitrophilic leukocyte of human blood.

8. Eukhromatin in the cores of spinal ganglion cells.

9. Blood of amphibian.

10. Human blood.

11. General morphology of animal cells. Liver cells.

12. The general structure of the animal cells in a single-layer Mesothelium, Cuboidal and cylindrical epithelium.

13. Smooth muscle tissue.

14. Heart muscle tissue (intercellular contacts)

15. Symplast (muscle fiber).

16. Astrocytic neuroglia.

17. Secretory cells of the salivary gland.

18. Cells and intercellular substance of loose connective tissue.

19. Cells and intercellular substance of hyalin cartilage.

20. Cilias of epithelial trachea cells.

The list of electron micrographs that student must be able to diagnose

1. Mitochondria in a neurosectoral cell.
2. Granular endoplasmic reticulum.
3. Golgi complex in the epitheliocytes of the small intestine.
4. Lysosomes
5. Epithelial cells with cilia
6. Tonofibril in the cells of the skin epidermis
7. Intercellular contacts in the spinous layer of the skin epidermis
8. Macrophag
9. Plasma cell
10. Tissue basophil
11. Ultrastructure of the nerve cell.
12. Ultrastructure of pancreatic cells.
13. Tyrocyte
14. Small intestine villi
15. Hepatocyte
16. Spermatozoid
18. Electronogram of chromaine in carioplasma.
19. Electronogram of cell mytotic division.
20. Electronogram of cell mytotic division at metaphase stage.

ASSESSMENT CRITERIA

The evaluation of the final control of the educational activity of the students of higher education is determined according to the traditional (four-point) scale.

Grade "5" (excellent):

Correct answers to 43 - 45 questions from 45 of the final test tasks

Correct answers to 95-100% of questions and demonstration of practical skills during the interview.

Grade "4" (good):

Correct answers to 38 - 42 questions from 45 of the final test tasks

Correct answers to 85-90% of questions and demonstration of practical skills during the interview.

Grade "3" (satisfactory):

Correct answers to 32 - 37 questions from 45 of the final test tasks

Correct answers to 70-80% of questions and demonstration of practical skills during the interview.

Grade "2" (unsatisfactory):

Correct answers less than 32 questions from 45 of the final test tasks

Correct answers are less than 70% of the questions and lack of practical skills during the interview.

Practical skills in working with a microscope

The practical skills control is based on the assessment of student's ability to work with a microscope, to analyze diagrams, histological specimens and electron micrographs, as well as illustrated tests which reflect the structure of cells and tissues of a human body.

The practical microscope skills imply the student's ability to set the light correctly, bring the specimen into focus, set the microscope to provide the desired magnification and achieve a clear image.

Criteria for assessing practical skills

High Level

1. The type of the specimens and the name of the microscopic specimens are correctly indicated.

2. The answer regarding the localization of the structures presented in the specimen is correct.

3. The answer regarding the characteristics of the microscopic and ultramicroscopic structure of the structures represented in the specimen is correct, complete and exhaustive.

4. The answer regarding the function of the structures represented in the specimen is correct, complete and exhaustive.

Sufficient level

1. The type of the specimen and the name of the microscopic specimen are correctly indicated.

2. The answer regarding the localization of the structures represented in the specimen in the cells and tissues is correct.

3. The answer regarding the characteristics of the microscopic and ultramicroscopic structure of the structures represented in the specimen is correct, but incomplete and/or contains inaccuracies.

4. The answer regarding the function of the structures represented in the specimen is correct, but incomplete and/or contains inaccuracies.

Satisfactory (Medium) Level

1. The type of the specimen and the name of the microscopic specimen are correctly indicated.

2. The answer regarding the localization of the structures represented in the specimen in the cells and tissues is correct.

3. The answer regarding the characteristics of the microscopic and ultramicroscopic structure of the structures represented in the specimen is correct, but incomplete, contains errors.

4. The answer regarding the function of the structures represented in the specimen is correct, but incomplete, contains errors.

Insufficient (Low) Level

1. The type of the specimen and the name of the microscopic specimen are not specified/indicated incorrectly.

2. It is not specified/indicated incorrectly, where exactly in the human body the localized structures presented in the specimen.

3. Characteristics of microscopic and ultramicroscopic structure of structures represented in the specimen are not provided/provided incorrect.

4. The functions of the structures presented in the preparation are not specified/indicated incorrectly.

To get the test (assessment for the semester), the applicant of higher education must work out all the missed classes (lectures and practical ones) and score at least 120 points for educational activities.

The counting of points received during the study of the discipline «Fundamentals of cytology»is carried out by the teacher at the last practical training of semester.

The number of points for the academic discipline «Fundamentals of cytology» is calculated as the average arithmetic assessment of the traditional four-point scale with rounding up to two decimal places, followed by conversion to a 200-point scale.

According to the number of points scored, the grade for the discipline «Fundamentals of cytology» (passed / failed) is determined by the two-level scale of the university, given below.

Evaluation scale

(According to the number of received points on the university scales assigned in accordance with such system):

Received points	Two-level evaluation scale
0-119	Not credited (failed)
120-149	Credited (graded)
150-179	
180-200	

RECOMMENDED LITERATURE

Basic literature

1. Histology: a text and atlas: with correlated cell and molecular biology / Michael H. Ross, Wojciech Pawlina. 6th ed. 2011.

2. Mescher A.L.: Junqueira’s Basic Histology: Text and Atlas, 14th ed. 2016.

3. Histology and cell biology: an introduction to pathology / Abraham L. Kierszenbaum, Laura L. Tres. 4th ed. 2015.

4. Cell and Molecular Biology Concepts and Experiments / Gerald Karp. - 2010, 765 P.

5. Molecular cell biology / Harvey Looish et al. 7th ed. 2013

6. World of the cell / Wayne M. Becker . . . [et al.]. 7th ed. – 2012. - 793 p.

7. Light microscopy in biology. A practical approach./ ed. by A. Lacey, 1989.

8. Normative documents regulating the educational process (Web-site of the medical faculty of V.N. Karazin KhNU, section "For students"). [Electronic resource]. - Access mode: http://medicine.karazin.ua/

Additional literature

1. Anatomy and Physiology / R. Seeley, T. Stephens, P. Tate. 6th ed. 2004.

2. Essential cell biology / Bruce Alberts et al. 4th ed. 2014.

3. The cell: a molecular approach / Geoffrey M. Cooper, Robert E .Hausman. 4th ed. 2007.

4. GRAY’S Anatomy the Anatomical Basis of Clinical Practice / Susan Standringet et al. 44th ed. 2016.

5. Human physiology / Stuart Ira Fox, Pierce College. 4th ed. 2016.

6. Leslie P. Gartner and James L. Hiatt, Color Textbook of Histology, 5th Edition: Elsevier Saunders: 2007, - p.573.

7. Young B., Heath J.W. Wheater’s Functional Histology a Text and Color Atlas, 5th ed., – 2007.

8. Saladin: Human Anatomy © The McGraw−Hill Companies, 2004

9. Shier−Butler−Lewis: Human Anatomy and Physiology, 9 Edition © The McGraw−Hill Companies, 2001.

LINKS TO THE INTERNET INFORMATION RESOURCES, VIDEO LECTURES, AND OTHER METHODOLOGICAL SUPPORT

1. Training materials of distance-learning courses "Basics of cytology", "Histology, cytology and embryology", "Histology, cytology and embryology_2","Special histology" (https://moodle.karazin.ua).

2. Histology Guide / T. Clark Breje, Robert L. Sorenson. 2005-2019. http://www.histologyguide.com

3. Histology website resources. University of Wisconsin School of medicine and public health. 2015. http://histologyatlas.wisc.edu

4. Using the microscope https://www.micrographia.com/tutoria/micbasic/micbpt01/micb0100.htm

5. Molecular Expressions: Exploring the world of optics and microscopy. https://micro.magnet.fsu.edu/

6. Microscopy.info http://www.microscopy.info/

7. http://histology-world.com/microscope/microscope2.htm

8. http://www1.udel.edu/biology/Wags/histopage/empage/empage.htm

9. https://www.cellsalive.com/

10. http://www.anatomyatlases.org/MicroscopicAnatomy

11. http://www.drjastrow.de/WAI/EM/EMAtlas.html

12. https://www2.ulb.ac.be/sciences/biodic/homepage2.html

13. http://medcell.med.yale.edu/systems_cell_biology/systems_cell_biology.php

ONLINE STUDYING

Preparation for classes. Preparation for classes is carried out by students independently on the basis of textbooks of Histology, cytology and embryology, Lectures (video lectures), Krok-1 questions book and training videos.

Classes. The classes and knowledge monitoring are carried out by your teacher in the Google Meet video chat according to your official Timetable (see The rules of conduct for online Classes, Credit and Final Exam below).

Rework of the classes. You have to rework your classes to your teacher in the Google Meet video chat according to the Rework Timetable (every teacher has his/her own Timetable of reworks, so they will announce it to you separately).

Academic honesty. Students found cheating in any form, will receive an automatic failing grade for the course and their names will be sent to the Dean of the Medical School for further disciplinary action.

Communication with teachers. For communication with teachers, email or a convenient messenger can be used by agreement.

RULES OF ONLINE CONDUCT

General rules:

1. The class, module and final exam will be video recorded.

2. The student taking a video proctored online class, module and final exam must prove their identity prior to the examination by showing their ID card, passport and credit book.

3. The student is obliged to show their room by making a 360° film of the room with the webcam.

4. The student must be dressed and behave decently at all times.

5. The student's room must be quiet and tranquil. There may not be sounds from music, television or any other sounds.

6. The webcam and microphone required for the class, module and final exam must be enabled and running.

7. The webcam must be focused on the student taking the class, module and final exam at all times.

8. The student's face must be positioned in the center of the webcam view and must be visible throughout the duration of the class, module and final exam.

9. Nothing may cover the lens of the webcam at any time during the class, module and final exam.

10. The student must face the webcam during the class, module and final exam constantly.

11. Wearing earplugs or headphones are not allowed.

12. There may not be any other people in the student's room.

13. There may not be other computers or similar devices running in the student'sroom.

14. Lighting must be "daylight" quality and overhead. If overhead lighting is not possible, the source of light should not be behind the student.

15. On the desk or other workplace, there may not be anything except a computer/tablet/cell phone and, in case the computer/tablet/cell phone does not have an internal webcam, an external web camera. All other materials have to be removed, unless explicitly permitted (ID card, passport and credit book).

Credit and Final Exam rules:

16. The teacher doesn't have to interpret given questions for the student as class, module and final exam questions require the student to make his/ her own interpretations or assumptions.

17. The question review is not allowed, providing no opportunity to change student answers.

18. The student doesn't have to receive assistance from the teacher, or anyone else, during the class, module and final exam.

19. The student doesn't have to repeat questions of the teacher out loud.

20. The student cannot access any resources during the class, module and final exam. This means no resources of any kind are allowed, including external websites, other software applications, or any other hardcopy resources. All other web browser tabs must be closed during the class, module and final exam. Cell phones and all other electronic devices must be turned off for the class, module and final exam.

21. The student may not leave the room after starting the class, module and final exam. Everything must be completed in one sitting. Restroom or other breaks aren't allowed.

22. The class, module and final exam has a specific amount of time allotted (max 15 minutes for each student) and a specific number of questions (2 questions for class and 3 questions for module and final exam).

23. Questions must be answered orally. No keyboard is required and typing is not allowed.

24. The student has to answer the teacher's questions immediately without any hesitation.

Cheating:

25. Cheating is a serious offence and subject to disciplinary action under Code of Ethics. Any evidence of cheating that occurs during the class, module and final exam would be noted in detail by the teacher. The teacher, who becomes aware that the student may have cheated or have failed to follow the rules in any way, is obligated to notify the Head of Department and Dean Office.

Examples of the cheating are:

 Any recording of the screens, including taking screenshots, pictures, or video.

 Copying the questions or answers.

 Leaving mobile devices/smart phones, other web browsers, software applications, or other computers on during the class, module and final exam.

 Having access to or consulting notes or books during the class, module and final exam.

 Allowing other individuals to be present, to come in and out of the room during the class, module and final exam.

 Talking or otherwise communicating with another person during the class, module and final exam.

 Arranging to have another person take a class, module and final exam for the student.

Breaking the class, credit and final exam rules:

26. If the student breaks the Rules, the student can be excluded from participating or continuing the class, module and final exam. The teacher may also

decide to nullify, not assess and/or not establish a result for the (partially) completed class, module and final exam.

Електронне навчальне видання комбінованого використання
Можна використовувати в локальному та мережному режимі

Проценко Олена Сергіївна
Чумак Любов Ігорівна

ОСНОВИ ЦИТОЛОГІЇ

Методичні рекомендації
для студентів І курсу медичного факультету

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