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FACULTY OF MEDICINE  
Department of «Histology, Embryology, Cytology»

# **HISTOLOGY: WORKBOOK**

**Textbook**

Bishkek 2025

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H 46

**Reviewers:**

*B.R. Dzhanaliev*, Doctor of Medical Sciences, Professor of the Kyrgyz State

Medical Academy named after I.K. Akhunbaev,

*F.R. Niyazova*, PhD, Associate Professor of the Kyrgyz State

Medical Academy named after I.K. Akhunbaev,

*Ch.E. Makimbetova*, MD., Associate Professor, Kyrgyz-Russian

Slavic University named after B.N. Yeltsin

**Compiled by:** Candidate of Medical Sciences, Associate Professor

*O.P. Kalugina*

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Histology Workbook has been compiled taking into account the modern educational standard and the curriculum for the discipline Histology for medical universities. It contains the basic materials necessary for the successful completion of the histology course. The content of the workbook corresponds to the qualification characteristics of graduates of medical universities. The material is intended for students of medical universities specializing in “Medical science” in order to organize and improve the effectiveness of independent work in preparation for classes.

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**O. P. Kalugina**

**WORKBOOK**  
**for practical classes**  
**in histology, embryology, cytology**  
Textbook

Student(s) \_\_\_\_\_ of the group \_\_\_\_\_ course

Specialization \_\_\_\_\_

\_\_\_\_\_  
(last name, first name)

20 \_\_\_\_\_ / \_\_\_\_\_ the year

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## **THE PREFACE**

This textbook complies with the federal state standard of education and the curriculum in histology for medical universities. The workbook is intended for independent work of international students in practical classes in histology, embryology, cytology and involves the assimilation of a large amount of theory. The workbook increases the productivity of using the allotted time for a practical lesson. The various elements of the logical structuring of the teaching elements of the lesson topic are aimed at ensuring uniform requirements for the quality of training of foreign students of medical faculties (universities). The systematic use of this textbook will contribute to the unification of the educational process, increase the effectiveness of students' independent work, master practical skills, and form and develop clinical thinking. The textbook will allow students to better master the studied material. The main purpose of the workbook is to ensure students' solid acquisition of fundamental knowledge in cytology, embryology, general and private histology.

The textbook is a methodological guide for students' independent work in histology, embryology and cytology. It consists of topics, goals and content of classes, self-preparation tasks, tests, a list of demonstration drugs and topics of abstract reports. The structure and presentation of the material corresponds to the histology curriculum. The author expresses his gratitude to the leading specialist of the Department of Histology, Embryology, Cytology M. M. Yakubova for providing technical assistance in compiling this textbook.

**Associate Professor,  
Candidate of Medical Sciences,  
Olga Petrovna Kalugina**

## **TOPIC: «INTRODUCTION TO HISTOLOGY. MICROSCOPIC TECHNIQUE»**

**The purpose of the lesson:** to familiarize the student with the order of work in practical classes, the stages of preparation of histological slides, the use of the microscope and the rules of working with it, as well as the special research methods in histology.

### **The student should know**

#### **Questions for preparation:**

1. The subject of histology, its sections, aims and objectives, its relationship with other medical and biological sciences.
2. Methods of research in histology.
3. Microscopic technique. The main stages in the preparation of histological slides.
4. Obtaining of material for histological specimens.
5. Fixation, fixatives.
6. Methods of embedding histological material.
7. Technique of sectioning.
8. Methods of staining histological slides, types of stains.
9. Equipment of the light microscope and rules of its use.
10. The essence and principles of special histological research methods: ultraviolet, phase contrast, luminescence microscopy, ultracentrifugation, autoradiography, tissue culture, vital staining, cytophotometry, microphotography, electron microscopy.

**The student should be able** to use a light microscope.

**The student should be able** to use the methods of histological technique in scientific and practical work.

#### **Topics of abstract reports:**

1. History of the light microscope.
2. Formation of histology as a science.
3. Possibilities of electron microscopy.

## SECTION 1. CYTOLOGY

### TOPIC: «CYTOLOGY. CELL STRUCTURE. CYTOPLASM»

**The purpose of the lesson:** to study the structure of the cell and its organelles.

**The student should know:**

**Questions for preparation:**

1. Basic cell theory.
2. Structural and functional organization of the cell.
3. Non-cellular structures (symplast, syncytium).
4. Organization of the cell membrane (cytolemma).
5. Transport of substances across the cytolemma (endocytosis, exocytosis).
6. Intercellular contacts.
7. Structure and functions of cellular organelles.
8. Organelles of a specialized cell.
9. Intracellular inclusions.
10. Hyaloplasm.

**The student should be able** to give a histophysiological assessment of various human cells.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Mitochondria in intestinal epithelial cells of an ascarid.
2. Intracellular reticulum (Golgi complex) in dorsal root ganglion neurons.
3. Glycogen in liver cells.
4. Fatty inclusions in liver cells.
5. Pigment inclusions in pigment cells (melanocytes).

**Topics of abstract reports.**

1. Organelles of substance synthesis.
2. Organelles of cellular energy supply.
3. Organelles of movement.

## CYTOLOGY TEST TASKS

### 1. What are the main chemical components of the cell membrane?

1. glycogen, proteins, polysaccharides
2. phospholipids, proteins, polysaccharides
3. phospholipids, acids, polysaccharides
4. proteins, acids, polysaccharides
5. glycogen, acids, proteins



**2. What are the structural elements of the cytoplasm?**

1. organoids, cytolemma, karyoplasm
2. inclusions, nucleus, hyaloplasm
3. organoids, inclusions, hyaloplasm
4. cytolemma, nucleus, inclusions
5. cytolemma, hyaloplasm, karyoplasm

**3. Which general-purpose organoids have a membrane structure?**

1. endoplasmic network
2. microtubules
3. centrosome
4. ribosomes
5. cell center

**4. Which general-purpose organoids have a non-membrane structure?**

1. Golgi complex
2. mitochondria
3. ribosomes
4. lysosomes
5. endoplasmic network

**5. Identify a special purpose organoid:**

1. Golgi complex
2. microvilli
3. microtubules
4. mitochondria
5. endoplasmic network

**6. Which general-purpose organoid is the energy source in the cell?**

1. mitochondria
2. microtubules
3. lysosomes
4. ribosomes
5. Golgi complex

**7. Which general-purpose organoid consists of two membranes?**

1. lysosomes
2. Golgi complex
3. mitochondria
4. endoplasmic network
5. ribosomes

**8. What is the chemical composition of ribosomes?**

1. 80% protein, 20% RNA
2. 60% protein, 40% RNA
3. 40% protein, 60% RNA
4. 20% protein, 80% RNA
5. 10% protein, 90% RNA

**9. What function do ribosomes perform in cells?**

1. synthesis fat
2. synthesis carbohydrate
3. synthesis protein
4. synthesis polysaccharide
5. synthesis lipid

**10. Determine the centriole formula:**

1.  $(9 \times 3) + 0$
2.  $(9 \times 2) + 2$
3.  $(8 \times 3) + 1$
4.  $(9 \times 3) + 1$
5.  $(8 \times 2) + 1$

**11. What is the structure of microtubules?**

1. a cylinder whose wall is formed from 13 myosin protein molecules
2. a cylinder whose wall is formed from 13 actin protein molecules
3. a cylinder whose wall is formed from 13 tubulin protein molecules
4. a cylinder whose wall is formed from 13 eleidin protein molecules
5. a cylinder whose wall is formed from 11 tubulin protein molecules

**12. What elements of cells are called inclusions?**

1. unstable accumulations of substances in the hyaloplasm
2. unstable accumulations of substances in the karyoplasm
3. permanent accumulations of substances in the hyaloplasm
4. permanent accumulations of substances in the karyoplasm
5. mixed accumulations of substances in the hyaloplasm

**13. What structural elements of the cell provide protein synthesis?**

1. Golgi complex, smooth endoplasmic network
2. mitochondria, microtubules
3. ribosomes, granular endoplasmic network
4. lysosomes, ribosomes
5. mitochondria, lysosomes

**14. Which cell organelles provide the synthesis of carbohydrates and lipids?**

1. Golgi complex, smooth endoplasmic network
2. mitochondria, microtubules
3. ribosomes, granular endoplasmic network
4. lysosomes, ribosomes
5. mitochondria, lysosomes

**15. Determine the formula of the axoneme of the cilia:**

1.  $(9 \times 2) + 2$
2.  $(9 \times 3) + 0$
3.  $(8 \times 3) + 1$
4.  $(8 \times 3) + 0$
5.  $(8 \times 2) + 1$

**16. Determine the formula of the basal body of the cilia:**

1.  $(9 \times 2) + 2$
2.  $(9 \times 3) + 0$
3.  $(8 \times 3) + 1$
4.  $(8 \times 3) + 0$
5.  $(8 \times 2) + 0$

**17. Determine the flagellum formula:**

1.  $(9 \times 2) + 2$
2.  $(9 \times 3) + 0$
3.  $(8 \times 3) + 1$
4.  $(8 \times 3) + 0$
5.  $(8 \times 2) + 0$

**18. Which cell organoid forms the spindle of cell division?**

1. ribosome
2. mitochondria
3. microtubules
4. lysosome
5. Golgi complex

**19. Which cell organoid is called an intracellular cleaner?**

1. ribosome
2. centrosome
3. lysosome
4. microtubules
5. Golgi complex

**20. Which cell organoid is a self-replicating structure that has its own DNA?**

1. ribosome
2. lysosome
3. microtubules
4. mitochondria
5. Golgi complex

**21. Which organoid of the cell is called the energy station of the cell?**

1. centrosome
2. ribosome
3. mitochondria
4. lysosome
5. Golgi complex

**22. Determine the source of lysosome development:**

1. endoplasmic network
2. Golgi complex
3. cell center
4. nucleolus
5. ribosome

**23. Determine the source of ribosome development:**

1. endoplasmic network
2. Golgi complex
3. cell center
4. nucleolus
5. mitochondria

**24. Determine the structural components of the Golgi complex:**

1. cylinders, cisterns
2. cisterns, tubules
3. dictyosomes, vesicles
4. tubules, vacuoles
5. channels, cylinders

**25. What is the chemical composition of the cytolemma?**

1. 60% protein, 40% lipids
2. 40% protein, 60% lipids
3. 80% protein, 20% lipids
4. 20% protein, 80% lipids
5. 10% protein, 90% lipids

**26. What type of contacts does nexus belong to?**

1. simple
2. split
3. dense
4. synaptic
5. desmosome

**27. Which organoid contains the dictyosome?**

1. lysosome
2. ribosome
3. centrosome
4. Golgi complex
5. mitochondria

**28. Determine the structural components of the endoplasmic network:**

1. dictyosome, vesicles, vacuoles
2. cylinders, cisterns, channels
3. dictyosome, ribosome, tubules
4. cylinders, vacuoles, tubules
5. dictyosome, lysosome, ribosome

**29. Determine the organoid of contraction:**

1. microvilli
2. microtubules
3. myofibrils
4. mitochondria
5. tonofibrils

**30. Determine the organoid of the nerve impulse:**

1. neurofibrils
2. cilia
3. microvilli
4. synaptic vesicles
5. myofibrils

**31. In the cytoplasm of pancreatic cells, secretory granules appear and disappear in the apical part during the secretory cycle. What structural elements of the cell can these granules be attributed to?**

1. inclusions
2. ribosome
3. peroxisomes
4. lysosomes
5. mitochondria

**32. As a result of the action of ionizing radiation in some cells, the destruction of individual organelles takes place. How will their residues be disposed of by the cell?**

1. primary lysosomes
2. phagosome
3. autolysosome
4. peroxisome
5. ribosome

**33. During the vital activity of the cell, the number of cisterns and tubules of the smooth endoplasmic network increases dramatically. Synthesis of which substances is activated in the cell?**

1. proteins
2. lipids
3. enzymes
4. inclusions
5. acid phosphatase

**34. The histological structure is determined on the preparation, limited by the cytoplasmic membrane, having a large amount of cytoplasm and many nuclei. What is it called?**

1. simplast
2. syncytium
3. cell
4. plate
5. non-nuclear cell

**35. When moving, the cell met a lump of organic matter. What is the possible mechanism of entry of this substance into the cell?**

1. endocytosis
2. exocytosis
3. mitosis
4. amitosis
5. meiosis

**36. Pigment granules appear in the cytoplasm of pigment cells under the influence of sunlight. To what structural elements of the cell can these granules be attributed?**

1. ribosomes
2. peroxisomes
3. inclusion
4. lysosomes
5. mitochondria

**37. What is endocytosis?**

1. removal of substances from the cell
2. entry of substances into the cell
3. intracellular digestion
4. energy accumulation
5. cell division

**38. What is the structure of lysosomes?**

1. membrane bubbles containing proteins
2. membrane bubbles containing polysaccharides
3. membrane bubbles containing lipids
4. membrane bubbles containing hydrolytic enzymes
5. membrane bubbles containing carbohydrates

**39. What is autophagocytosis?**

1. digestion in secondary lysosomes of proteins
2. digestion in secondary lysosomes of polysaccharides
3. digestion in secondary lysosomes of lipids
4. digestion in secondary lysosomes of intracellular structures
5. digestion in secondary lysosomes of carbohydrates

**40. The cells were affected by a drug that changes the structure of ribosomes. Which processes will be disrupted in the first place?**

1. synthesis lipid
2. synthesis polysaccharide
3. synthesis protein
4. synthesis acid
5. synthesis carbohydrates

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
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**Date:**\_\_\_\_\_ **Points:**\_\_\_\_\_ **Teachers signature:**\_\_\_\_\_

## TOPIC: «NUCLEUS. CELL DIVISION»

**The purpose of the lesson:** to study the structural and functional organization of the cell nucleus and the methods of cell division.

### *The student should know*

#### **Questions for preparation:**

1. The structure of the nucleus.
2. The role of the nucleus in storing and transmitting genetic information and in protein synthesis.
3. Organization of the nuclear envelope (caryolemma).
4. Structure of the nuclear pore complex.
5. Morphology of mitotic chromosomes. Karyotype.
6. Structural and functional organization of the nucleus, karyoplasm.
7. Stages in the life cycle of the cell.
8. Cell division.
9. Phases of mitosis.
10. Cell death.

*The student should be able* to give a histophysiological assessment of the state of cells.

*The student should master* to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Karyokinesis (indirect division) or mitosis (onion stalk).
2. Mitosis of an animal cell (marginal zone of axolotl liver).
3. Amitosis in the cells of the Descemet membrane of the horse's eye.

#### **Topics of abstract reports.**

1. Apoptosis as a form of cell death.
2. Necrosis in cell damage.
3. Forms of amitotic cell division.

## TEST TASKS

### **1. What structural elements form the nucleus:**

1. hyaloplasm, organoids, cytolemma
2. karyoplasm, chromatin, karyolemma
3. organoids, nucleolus, inclusions
4. chromatin, hyaloplasm, karyolemma
5. inclusions, chromatin, karyoplasm



**2. Determine the formula of the nuclear pores:**

1.  $(9 \times 3) + 0$
2.  $(9 \times 2) + 2$
3.  $(8 \times 3) + 1$
4.  $(8 \times 3) + 0$
5.  $(8 \times 2) + 0$

**3. Specify the components of the nuclear pores:**

1. supporting, granular
2. fibrillar, granular
3. trophic, granular
4. membrane, granular
5. trophic, membrane

**4. What process leads to the formation of two cells with an equal diploid set of chromosomes?**

1. meiosis
2. mitosis
3. amitosis
4. phagocytosis
5. exocytosis

**5. How do old, damaged cells divide?**

1. mitosis
2. amitosis
3. meiosis
4. phagocytosis
5. exocytosis

**6. What is the cell cycle?**

1. prophase, interphase
2. metaphase, interphase
3. mitosis, interphase
4. amitosis, interphase
5. exocytosis, mitosis

**7. Which method of division leads to the formation of two cells of unequal size?**

1. mitosis
2. meiosis
3. amitosis
4. phagocytosis
5. exocytosis

**8. How are multinucleated cells formed?**

1. pulling
2. fragmentation
3. budding
4. pinocytosis
5. phagocytosis

**9. In what phase of mitosis does the despiralization of chromosomes occur?**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**10. In what phase of mitosis do the centrioles double and diverge along the poles?**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**11. Determine the duration of the mitosis telophase:**

1. 2 minutes
2. 10 minutes
3. 20 minutes
4. 60 minutes
5. 90 minutes

**12. In what phase of mitosis does the formation of the division spindle end?**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**13. In what phase of mitosis does cytotomy (cytokinesis) occur?**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**14. Determine the longest phase of mitosis:**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**15. Determine the shortest phase of mitosis:**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**16. In what period of mitosis do chromosomes spiral and become visible?**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**17. Determine which interphase period is the longest in time:**

1. G1
2. S
3. G2
4. G0
5. M

**18. Determine which interphase period is the shortest in time:**

1. G1
2. S
3. G2
4. G0
5. M

**19. In what period of interphase does the number of chromosomes double?**

1. G1
2. S
3. G2
4. G0
5. M

**20. How do germ cells divide?**

1. mitosis
2. amitosis
3. meiosis
4. phagocytosis
5. pinocytosis

**21. Determine the method of cell division in which there is no synthetic interphase period:**

1. mitosis
2. amitosis
3. meiosis
4. phagocytosis
5. pinocytosis

**22. Determine the method of cell division in which there are no periods of interphase**

1. mitosis
2. amitosis
3. meiosis
4. phagocytosis
5. pinocytosis

**23. What is the interphase period called the growth period?**

1. G1
2. S
3. G2
4. G0
5. M

**24. What is the interphase period called the energy period?**

1. G1
2. S
3. G2
4. G0
5. M

**25. Determine the duration of the energy period of the interphase:**

1. 4 hours
2. 6 hours
3. 10 hours
4. 20 hours
5. 24 hours

**26. In what period of the cell cycle are dormant cells that have stopped multiplying?**

1. G0
2. G1
3. G2
4. S
5. M

**27. In the growing tissues of animals there are always cells that are “out of the cycle”. What are these cells called?**

1. cells S – period
2. cells G<sub>0</sub> – period
3. cells G<sub>1</sub> – period
4. cells G<sub>2</sub> – period
5. cells Mitosis

**28. Determine the process by which large particles are captured and absorbed by the cell:**

1. exocytosis
2. pinocytosis
3. phagocytosis
4. mitosis
5. amitosis

**29. Determine the process by which small particles are captured and absorbed by the cell:**

1. exocytosis
2. pinocytosis
3. phagocytosis
4. amitosis
5. mitosis

**30. Determine the process by which substances are excreted from the cell:**

1. exocytosis
2. pinocytosis
3. phagocytosis
4. mitosis
5. amitosis

**31. The cell was treated with a drug that blocks the function of the nucleolus. Which processes will be disrupted in the first place?**

1. lipid synthesis
2. polysaccharide synthesis
3. protein synthesis
4. phagocytosis
5. pinocytosis

**32. The cell nucleus was treated with preparations that destroy histone proteins. Which structure will suffer in the first place?**

1. karyolemma
2. chromatin
3. nucleolus
4. karyoplasm
5. cytolemma

**33. On the preparations, a decrease in the size of cell nuclei, their compaction, and wrinkling were observed. What is the name of this phenomenon?**

1. mitosis
2. amitosis
3. phagocytosis
4. pyknosis
5. meiosis

**34. What processes take place in the cell during prophase?**

1. chromosome spiralization, nucleolus decay, karyolemma lysis
2. chromosome despiralization, nucleolus assembly, karyolemma lysis
3. chromosome spiralization, nucleolus assembly, karyolemma lysis
4. chromosome despiralization, nucleolus decay, karyolemma lysis
5. chromosome despiralization, cytolemma lysis, karyolemma lysis

**35. What happens during metaphase?**

1. the spindle of division begins to form, the threads of the spindle of division are attached to the chromosomes
2. the final formation of the spindle of division, the threads of the spindle of division are attached to the chromosomes
3. the chromosomes diverge along the poles
4. despiralization of chromosomes
5. chromosome spiralization

**36. What happens during anaphase?**

1. cytotomy
2. chromosome spiralization
3. chromosome despiralization
4. chromosome divergence to the poles of the cell
5. cytokinesis

**37. What happens in the cell during telophase?**

1. chromosome spiralization, nucleolus disintegration
2. chromosome despiralization, nucleolus formation
3. chromosome divergence to the poles of the cell
4. location of chromosomes along the equator of the cell
5. the division spindle is finally formed

**38. What is the mitotic cycle?**

1. exocytosis
2. endocytosis
3. interphase, mitosis
4. prophase, metaphase, anaphase, telophase
5. amitosis

**39. Determine the phase of mitosis, if a spindle of division is formed in the cell, the chromosomes are located in the equatorial plane of the spindle:.**

1. prophase
2. metaphase
3. anaphase
4. telophase
5. interphase

**40. Mitosis is a:**

1. cell division in which there is no process of chromosome reduplication
2. direct cell division
3. indirect cell division
4. formation of daughter cells with a haploid set of chromosomes
5. formation of cell with an increased number of chromosome sets

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## SECTION 2. EMBRYOLOGY

### TOPIC: «GENERAL EMBRYOLOGY. PROGENESIS, FERTILIZATION»

**The purpose of the lesson:** to study the structure of the oocyte and the spermatozoon, ovogenesis, spermatogenesis, stages of fertilization.

**The student should know:**

**Questions for preparation:**

1. Embryology as a science.
2. The relationship between historical and individual development (phylogeny and ontogeny).
3. Spermatogenesis, stages, factors.
4. Structure and functions of vertebrate spermatozoa.
5. Ovogenesis, stages, characteristics.
6. Structure and types of oocytes, classification according to type of distribution and amount of yolk.
7. Sex cells, characteristics, interaction.
8. Stages of embryogenesis.
9. Fertilization, stages.
10. The zygote is a single-celled embryo.

**The student should be able** to give a histophysiological assessment of male and female germ cells.

**The student should master** to microscope and analysis histological slides.

Demonstration slides:

1. Oocyte in frog ovary.
2. Spermatozoa.

**Topics of abstract reports:**

1. Factors influencing gametogenesis and fertilization.
2. Extracorporeal fertilization.
3. The concept of ontogenesis and phylogenesis, the relationship between ontogenesis and phylogenesis.

## TEST TASKS

### Progenesis

**1. What organoid is the egg devoid of?**

1. endoplasmic reticulum
2. centrosomes
3. lysosomes
4. ribosomes
5. mitochondria



**2. Which general-purpose organoid is modified in the sperm, if it is damaged, fertilization is impossible?**

1. endoplasmic network
2. mitochondria
3. Golgi complex
4. lysosomes
5. ribosomes

**3. What inclusions are contained in the egg?**

1. trophic
2. secretory
3. excretory
4. pigmented \
5. mixed

**4. Which components of the egg cytoplasm provide the formation of different types of eggs?**

1. organoids of the general value of the membrane structure
2. special purpose organoids
3. inclusions
4. organoids of general significance of non-membrane structure
5. nucleolus

**5. Which components of the egg cytoplasm are yolk granules?**

1. lysosomes
2. peroxisomes
3. ribosomes
4. inclusions
5. mitochondria

**6. Which organoid of special significance does the sperm have?**

1. microvilli
2. myofibrils
3. flagellum
4. neurofibrils
5. tonofibrils

**7. Determine the formula of the sperm flagellum?**

1.  $(9 \times 3) + 0$
2.  $(9 \times 2) + 2$
3.  $(8 \times 3) + 1$
4.  $(8 \times 3) + 0$
5.  $(8 \times 2) + 0$

**8. Which general-purpose organoid does the sperm acrosome belong to?**

1. peroxisome
2. lysosome
3. ribosome
4. Golgi complex
5. mitochondria

**9. Determine the set of chromosomes in the sperm?**

1. diploid
2. haploid
3. tetraploid
4. multiploid
5. 46

**10. Determine how long a human egg spends its reserve of nutrients after ovulation, and then dies if there is no fertilization?**

1. 12–24 minutes
2. 12–24 hours
3. 12–24 days
4. 24–28 days
5. 60–90 days

**11. Determine the type of amphibian egg (frog)?**

1. primary isolecital
2. secondary isolecital
3. moderately telolecital
4. sharply telolecital
5. centrolecital

**12. What type of egg do birds have?**

1. primary isolecital
2. secondary isolecital
3. moderately telolecital
4. sharply telolecital
5. centrolecital

**13. What type of egg does a person have?**

1. primary isolecital
2. secondary isolecital
3. moderately telolecital
4. sharply telolecital
5. centrolecital

**14. Determine the speed of movement of the human sperm?**

1. 1–5 mm per minute
2. 1–5 cm per minute
3. 1–5 meters per minute
4. 1–5 mm per second
5. 5–10 cm per minute

**15. For how long do human spermatozoa retain their fertilizing ability?**

1. 24–36 seconds
2. 24–36 minutes
3. 24–36 hours
4. 4–6 days
5. 24–28 days

**16. How long does the process of spermatogenesis in humans last?**

1. 75 seconds
2. 75 minutes
3. 75 hours
4. 75 days
5. 90 days

**17. What period of spermatogenesis does spermiogenesis belong to?**

1. breeding period
2. growth period
3. maturation period
4. formation period
5. reproduction period

**18. At what stage of the growth period does a spermatocyte of the first order contain a tetraploid set of chromosomes?**

1. leptogenic stage
2. zygote stage
3. pachinema stage
4. diplonema stage
5. reproduction stage

**19. What stage of gametogenesis is absent in ovogenesis?**

1. reproduction
2. small growth
3. maturation
4. formation
5. large growth

**20. At what stage of gametogenesis are the reduction corpuscles formed?**

1. reproduction
2. small growth
3. maturation
4. formation
5. large growth

**21. Determine the set of chromosomes in the zygote?**

1. haploid
2. diploid
3. tetraploid
4. multiploidy
5. 23

**22. What is a zygote?**

1. single-celled embryo
2. two-cell embryo
3. single-layer embryo
4. two-layer embryo
5. multi-layer embryo

**23. By the formation of which shell does the egg protect itself from the penetration of other spermatozoa?**

1. serous membrane
2. amniotic membrane
3. fertilization shells
4. follicular membrane
5. cell membrane

**24. Which sperm organoid contains enzymes (trypsin, hyaluronidase) that destroy egg shells?**

1. centrosome
2. acrosome
3. lysosome
4. ribosome
5. mitochondria

**25. Define what is a syncarion?**

1. splitting
2. epibolia
3. prominence
4. fusion
5. invagination

**26. Define what is penetration?**

1. rotation
2. splitting
3. intrusion
4. fusion
5. invagination

**27. Determine the duration of the first stage of embryogenesis – fertilization in humans?**

1. 1 hour
2. 10 hours
3. 24 hours
4. 36 hours
5. 72 hours

**28. What is formed in the egg in the area of attachment of the sperm?**

1. primary tubercle
2. the tubercle of perception
3. the Gensen knot
4. primary nodule
5. the Gensen nodule

**29. Determine the isolecital egg?**

1. the egg contains a lot of yolk in the center
2. the egg contains a lot of yolk on the vegetative pole
3. the egg contains a lot of yolk on the animal pole
4. the egg contains little yolk, evenly distributed throughout the cytoplasm
5. the egg contains little yolk in the center

**30. Determine the telolecital egg?**

1. the egg contains a lot of yolk in the center
2. the egg contains a lot of yolk at the vegetative pole
3. the egg contains a lot of yolk on the animal pole
4. the egg contains little yolk, evenly distributed throughout the cytoplasm
5. the egg contains little yolk in the center

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## **TOPIC: «STAGES OF EMBRYOGENESIS. CLEAVAGE, GASTRULATION, DIFFERENTIATION OF THE MESODERM»**

**The purpose of the lesson:** to study the types of cleavage and the types of blastula, the methods of gastrulation, the formation of germ layers.

### **Student should know**

#### **Questions for preparation:**

1. Cleavage, nature and biological significance.
2. Types of blastula, their structure.
3. Definition of the nature of the gastrulation process.
4. The main types of gastrulation and their characteristics.
5. The concept of presumptive embryonic material.
6. Formation of germ layers, mesenchyme.
7. Differentiation of mesoderm.
8. Development of the lancelet.
9. Development of amphibians.
10. Development of the bird.

**The student should be able** to give a histophysiological assessment of the different stages of embryogenesis.

**The student should master** to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Frog egg fragmentation.
2. Frog blastula (sagittal section).
3. Early gastrula of frog (sagittal section).
4. Early neurula of frog (transverse section.).

#### **Topics of abstract reports:**

1. Embryonic induction.
2. The concept of determination, integration.
3. Mechanisms of cell movements.

## **TEST TASKS**

### **1. Determine the second stage of embryogenesis – cleavage and formation of a blastula?**

1. complex process of chemical and morphological changes, resulting in the formation of germ leaves
2. union of male and female germ cells, resulting in the formation of a zygote
3. multiple mitotic division of the zygote, in which there is no growth period
4. differentiation of embryonic rudiments with the formation of tissues and organs
5. penetration – contact interaction

**2. Determine the type of cleavage of the human zygote?**

1. complete even
2. complete uneven
3. incomplete discoidal
4. incomplete surface
5. incomplete partial

**3. Determine the third type of embryogenesis – gastrulation?**

1. complex process of chemical and morphological changes, resulting in the formation of germ leaves
2. fusion of male and female germ cells, resulting in the formation of a zygote
3. multiple mitotic division of the zygote, in which there is no growth period
4. differentiation of embryonic rudiments with the formation of tissues and organs
5. penetration – contact interaction

**4. As a result of what processes two- or three-layer embryos are formed?**

1. fertilization
2. cleavage
3. gastrulation
4. histogenesis
5. organogenesis

**5. An embryo consisting of an even number of blastomeres having the same size is visible on the preparations. Determine what type of cleavage is characteristic of this embryo?**

1. complete even
2. complete uneven
3. incomplete discoidal
4. incomplete surface
5. incomplete partial

**6. In the embryo fragmentation is noted only at the animal pole. What is the name of this type of cleavage?**

1. complete even
2. complete uneven
3. incomplete discoidal
4. full synchronous
5. complete asynchronous

**7. As a result of cleavage, micro- and macroblastomeres are formed in one embryo. Determine the type of cleavage?**

1. complete even
2. complete uneven
3. incomplete discoidal
4. incomplete surface
5. incomplete partial

**8. On the preparation of a blastula with a multilayer blastoderm. The blastocele is located eccentrically. Determine the type of blastula?**

1. celoblastula
2. amphiblastula
3. discoblastula
4. blastocyst
5. human blastula

**9. On the preparation of a blastula with a single-layer blastoderm. The blastocele is located in the center. Determine the type of blastula?**

1. celoblastula
2. amphiblastula
3. discoblastula
4. blastocyst
5. human blastula

**10. On the preparation, a multilayer blastula is a germ disk spread out on the yolk. Determine the type of blastula?**

1. celoblastula
2. amphiblastula
3. discoblastula
4. blastocyst
5. human blastula

**11. In the experiment, a substance blocking the movement of cells was introduced at the blastula stage. What stage of embryogenesis will be blocked?**

1. fertilization
2. cleavage
3. gastrulation
4. histogenesis
5. organogenesis

**12. Which of the listed representatives has gastrulation performed by epiboly (fouling)?**

1. lancet
2. amphibian
3. birds
4. human
5. mammal



**13. In the experiment, the process of cell movement through the primary strip was blocked in the embryo of a bird at the gastrula stage. The development of which germ leaf will be disrupted?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**14. On the preparation of a blastula, in which a trophoblast and an embryoblast are distinguished. Determine the type of blastula?**

1. celoblastula
2. amphiblastula
3. discoblastula
4. blastocyst
5. blastula of frog

**15. In the experiment, the embryo of a chicken disrupted the process of fusion of amniotic folds. The formation of which pharmacological body will be disrupted?**

1. yolk sac
2. allantois
3. amnion
4. chorion
5. embryo

**16. In an experiment, an extra-embryonic endoderm was damaged in a chicken embryo. The formation of which pharmacological body will be disrupted?**

1. yolk sac
2. amnion
3. serous membrane
4. chorion
5. embryo

**17. In an experiment, an extra-embryonic ectoderm was damaged in a chicken embryo. The formation of which pharmacological body will be disrupted?**

1. yolk sac
2. allantois
3. amnion
4. chorion
5. embryo

**18. During the development of the embryo, the pharmacological organ performing trophic and hematopoietic functions is damaged. What is the name of this organ?**

1. serous membrane
2. amnion
3. allantois
4. yolk sac
5. chorion

**19. During the development of the embryo, the pharmacological organ that performs the function of isolating metabolites is damaged. What is the name of this organ?**

1. serous membrane
2. amnion
3. allantois
4. yolk sac
5. chorion

**20. What is the name of the pharmacological respiratory organ?**

1. serous membrane
2. amnion
3. allantois
4. yolk sac
5. chorion

**21. During the development of the embryo, the pharmacological organ is damaged, which performs a protective function – the creation of an aquatic environment favorable for the free development of the embryo. What is the name of this organ?**

1. serous membrane
2. amnion
3. allantois
4. yolk sac
5. chorion

**22. On the preparation of the human embryo, the process of separating the embryo material from the emerging pharmacological organs is visible. With the help of what structure is this process going on?**

1. equatorial furrow
2. tangential furrow
3. amniotic fold
4. bodies fold
5. meridian furrow

**23. The experimenter destroyed myotome cells in the embryo. Which tissue development will be affected by this damage?**

1. epithelial
2. connecting
3. muscle
4. nervous
5. bone

**24. The developing embryo was destroyed by a nephrotome. Which system's development will be disrupted?**

1. respiratory
2. endocrine
3. nervous
4. excretory
5. digestive

**25. The developing embryo was destroyed by sclerotome. On the development of which tissue will this affect in this body?**

1. epithelial
2. bone
3. muscle
4. nervous
5. glandular

**26. The developing embryo was destroyed by a dermatome. Which tissue development will be affected by this damage?**

1. epithelial
2. connecting
3. muscle
4. nervous
5. glandular

**27. The cell material of the primary nodule was destroyed in the developing embryo. Which tissue development will be affected by this damage?**

1. epithelial
2. connecting
3. muscle
4. nervous
5. glandular

**28. The developing embryo was destroyed by splanchnotome. What structures will be disrupted in this organism?**

1. skin
2. bone
3. pleura
4. trachea
5. teeth

**29. Violation of which stage of embryogenesis causes the birth of identical twins?**

1. fertilization
2. cleavage
3. gastrulation
4. histogenesis
5. organogenesis

**30. Which tissue develops from the mesenchyme?**

1. smooth muscle tissue
2. skeletal muscle tissue
3. cardiac muscle tissue
4. nerve tissue
5. epidermal tissue

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## **CONTROL QUESTIONS ON CYTOLOGY AND EMBRYOLOGY**

1. Basic stages of preparation of histological slides.
2. General characterization of cell structure and function.
3. Cytoplasm, composition, functions.
4. Types of intercellular contacts.
5. Cytolemma, structure, functions.
6. General membrane organoids of membrane origin (endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes, mitochondria), structure, functions.
7. General-purpose organoids of non-membrane origin (ribosomes, microtubules, centrosome).
8. Specialized organoids (tonofibrils, myofibrils, neurofibrils, microvilli, cilia, flagella, synaptic vesicles).
9. Inclusions, types, functions.
10. Nucleus, composition, functions.
11. Karyolemma, nuclear pores, structure, functions.
12. Morphology of mitotic chromosomes, nucleus, structure, functions.
13. Characterization of cell life cycle.
14. Interphase, periods (G<sub>0</sub>, G<sub>1</sub>, S, G<sub>2</sub>), duration, functions.
15. Cell division (mitosis, amitosis, meiosis).
16. Mitosis - indirect cell division, phases, processes, duration, disorders.
17. Amitosis - direct cell division, types, characteristics.
18. Reactive changes in cells under the influence of extreme environmental factors.
19. Spermatogenesis, stages.
20. Oogenesis, stages.
21. Spermatozoa, structure, function.
22. Ovum, structure, classification.
23. Stages of embryogenesis.
24. Fertilization, stages (convergence, penetration, syngamy).
25. Cleavage, types, furrows, types of blastula, structure.
26. Gastrulation, types.
27. Differentiation of germ layers.
28. Histogenesis.
29. Organogenesis.
30. Extraembryonic organs (amnion, allantois, yolk sac, serous membrane), structure, functions.

## SECTION 3. GENERAL HISTOLOGY

### TOPIC: «EPITHELIAL TISSUES»

**The purpose of the lesson:** to study the sources of development, morpho-functional and localization of different types of epithelium.

**The student should know**

**Questions for preparation:**

1. Define the term “tissue”.
2. Classification of tissues.
3. Sources of epithelial tissue development.
4. Genetic classification of epithelia.
5. Morpho-functional classification of epithelia and their general characterization.
6. Characteristics of epithelial tissues.
7. Classification, structure and functions of epithelia.  
Simple and stratified epithelia.
8. Classification, structure, and functions of stratified epithelia.
9. Glands, general characteristics and classification.
10. Secretion and its types: merocrine, apocrine, holocrine.

**The student should be able** to identify the epithelium, its layers and cellular composition.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Simple squamous epithelium (mesothelium) (upper view).
2. Single layer of cylindrical epithelium of the villi of the small intestine. of the small intestine.
3. Transitional epithelium of the bladder (epithelium at the dilated wall of the wall of the organ).
4. Stratified squamous (non-corneal) epithelium of the cornea of the eye.
5. Stratified squamous keratinizing epithelium of the skin of a human finger.

**Topics of abstract reports:**

1. Epithelium of the respiratory tract.
2. Development, structure, and function of the basement membrane.
3. Ultramicroscopic features of the structure of glandular cells.

## TEST TASKS

**1. In the epithelium, all cells are cylindrical in shape and all lie on the basal membrane. What type of epithelium is this?**

1. pseudostratified columnar
2. simple columnar
3. stratified transitional
4. stratified non-keratinized
5. stratified keratinized

**2. In the epithelium, cells are of different heights, all lying on the basal membrane. What type of epithelium is this?**

1. pseudostratified columnar
2. simple columnar
3. stratified transitional
4. stratified non-keratinized
5. stratified keratinized

**3. In the layers of the epithelium, there are three types of cells: basal, spinosum and flat. What type of epithelium is this?**

1. pseudostratified columnar
2. simple columnar
3. stratified transitional
4. stratified non-keratinized
5. stratified keratinized

**4. What is the source of development for intestinal epithelium?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**5. What is the source of development for skin epithelium?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**6. What is the source of development for coelomic nephrodermal epithelium?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**7. What type of secretion occurs in glands without cell destruction?**

1. merocrine
2. apocrine
3. holocrine
4. endocrine
5. exocrine

**8. What type of secretion occurs in glands with complete cell destruction?**

1. merocrine
2. apocrine
3. holocrine
4. endocrine
5. exocrine

**9. Which of the following structures of an epithelial cell is located at the apical surface?**

1. ribosomes
2. mitochondria
3. endoplasmic reticulum
4. microvilli
5. lysosomes

**10. At what level should the nucleus be located in an epithelial cell?**

1. in the center
2. at the basal surface
3. at the apical surface
4. at any surface
5. excentrical

**11. What specialized organelle in the epithelium increases the absorptive surface area of the cell?**

1. flagellum
2. cilia
3. microvilli
4. tonofibrils
5. lysosomes

**12. In the epithelium, the layers visible are: basal, spinosum, granular, lucidum, and keratinized. What type of epithelium is this?**

1. pseudostratified
2. stratified keratinized
3. stratified non-keratinized
4. stratified transitional
5. simple columnar



**13. In which layer of stratified squamous keratinized epithelium is the substance keratohyalin found?**

1. basal
2. spinosum
3. granular
4. lucidum
5. keratinized

**14. In which layer of stratified squamous keratinized epithelium is the substance eleidin found?**

1. basal
2. spinosum
3. granular
4. lucidum
5. keratinized

**15. In which layer of stratified squamous keratinized epithelium is the substance keratin found?**

1. basal
2. spinosum
3. granular
4. keratinized
5. lucidum

**16. To which histogenetic type does the epithelium developing from mesenchyme belong?**

1. endodermal
2. ectodermal
3. angiodermal
4. coelomic nephrodermal
5. ependyma glial

**17. To which histogenetic type does the simple columnar epithelium of the stomach belong?**

1. endodermal
2. ectodermal
3. angiodermal
4. coelomic nephrodermal
5. ependymoglia

**18. To which histogenetic type does the simple cuboidal epithelium of the kidney tubules belong?**

1. endodermal
2. ectodermal
3. angiodermal
4. coelomic nephrodermal
5. ependymoglia

**19. To which histogenetic type does the epithelial lining of the spinal canal belong?**

1. endodermal
2. ectodermal
3. ependymoglia
4. angioblastic
5. coelomic nephrodermal

**20. Which epithelia are included in the group of stratified types?**

1. simple, transitional, keratinized
2. transitional, keratinized, non-keratinized
3. pseudostratified, transitional, keratinized
4. simple, pseudostratified, transitional
5. pseudostratified, simple, non-keratinized

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## TOPIC: «BLOOD AND LYMPH»

**The purpose of the lesson:** to study the structure and function of the elements that make up blood, the composition and role of plasma, lymph, leukocyte formula, hemogram.

**The student should know:**

**Questions for preparation:**

1. Blood: characterization of it as a tissue, sources of development, functions.
2. Blood plasma: chemical composition, functional significance.
3. Erythrocytes: structure, number, functional significance.  
Poikilocytosis, anisocytosis.
4. Leukocytes: general characteristics, classification, number in blood.
5. Granulocytes: structure, functions.
6. Agranulocytes: structure, functions.
7. Leukocyte formula, significance for the clinic. The concept of leukocyte formula shift “to the left” and “to the right”.
8. Platelets: morpho-functional characteristics, peripheral blood content.
9. Hemogram. Age-specific characteristics of blood.
10. Lymph: composition, functions.

**The student should be able** to identify blood formers in a smear, assess the state of the leukocyte formula.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Frog blood (smear).
2. Human blood (smear).

**Topics of abstract reports:**

1. Morphofunctional characterization of lymph.
2. Role of leukocytes in inflammation.
3. Morpho-functional characterization of platelets.

## TEST TASKS

**1. Source of blood development:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**2. Percentage of plasma in the blood:**

1. 30 %
2. 40 %
3. 60 %
4. 90 %
5. 10 %

**3. Percentage of blood cells:**

1. 30 %
2. 40 %
3. 60 %
4. 90 %
5. 10 %

**4. Percentage of water in blood plasma:**

1. 30 %
2. 40 %
3. 60 %
4. 90 %
5. 10 %

**5. Percentage of dry matter in blood plasma:**

1. 10 %
2. 30 %
3. 40 %
4. 60 %
5. 90 %

**6. Which proteins belong to blood plasma proteins:**

1. collagen
2. elastin
3. fibrinogen
4. rhodopsin
5. hemoglobin

**7. What are erythrocytes?**

1. cell
2. a nuclear-free cell
3. plate of blood
4. multi-nucleus cell
5. symplast

**8. What are the components of erythrocytes?**

1. nucleus
2. organelles
3. inclusions
4. organelles for special purpose
5. general organelles

**9. What protein is included in erythrocytes?**

1. albumin
2. globulin
3. fibrinogen
4. hemoglobin
5. collagen

**10. Most erythrocytes have the form:**

1. sickle
2. double concave
3. double convex
4. star
5. flat

**11. From which cells platelets are directly formed:**

1. from promyelocytes
2. from normocytes
3. from megakaryocytes
4. from metamyelocytes
5. from myelocytes

**12. What cells of the neutrophilic series normally enter the blood mainly?**

1. myelocytes
2. metamyelocytes
3. rod leukocytes
4. segmented leukocytes
5. promyelocytes

**13. What is a platelet?**

1. cell
2. nuclear-free cell
3. fragment of cytoplasm
4. multi-nuclear cell
5. symplast

**14. Name a cell that is common for cells of the myeloid, lymphoid series:**

1. megakaryoblast
2. proerythrocyte
3. promyelocyte
4. stem pluripotent blood cell
5. monoblast

**15. What cells do monocytes differentiate into?**

1. into macrophages
2. into plasma cells
3. into lymphocytes
4. into lipocytes
5. into fibroblast

**16. What is the percentage of neutrophils in the total number of leukocytes?**

1. 0.5–1%
2. 2–5%
3. 6–8%
4. 65–75%
5. 20 %

**17. What is the percentage of reticulocytes in peripheral blood?**

1. 1 %
2. 5 %
3. 8 %
4. 65 %
5. 20 %

**18. What is the percentage of eosinophils in the total number of leukocytes?**

1. 0.5–1%
2. 2–5 %
3. 6–8%
4. 65–75%
5. 20 %

**19. What is the percentage of basophils in the total number of leukocytes?**

1. 0.5–1%
2. 2–5%
3. 6–8%
4. 65–75%
5. 20 %

**20. What is the percentage of monocytes from the total number of leukocytes?**

1. 0.5–1%
2. 2–5%
3. 6–8%
4. 65–75%
5. 20 %

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## TOPIC: «HEMATOPOIESIS»

**The purpose of the lesson:** to study the classes of hematopoietic cells.

**The student should know:**

**Questions for preparation:**

1. General concept of hematopoiesis.
2. Stages of hematopoiesis.
3. Embryonic hematopoiesis (mesoblastic, hepatolienal, medullary).
4. Postembryonic hematopoiesis. The concept of the hematopoietic stem cell.
5. Structure and histophysiology of myeloid and lymphoid tissues.
6. Erythrocytopoiesis.
7. Granulocytopoiesis.
8. Monocytopoiesis.
9. Lymphocytopoiesis.
10. Thrombocytopoiesis.

**The student should be able** to distinguish between classes of hematopoietic cells.

**The student should master** to microscope and analysis histologic slides.

**Demonstration slides:**

1. Red bone marrow (punctate) (scheme of hematopoiesis).

**Topics of abstract reports:**

1. Factors stimulating hematopoiesis.
2. Inhibitors of hematopoiesis.
3. Characteristics of medullary hematopoiesis in the adult organism.

## TEST TASKS

**1. Cells with large oxyphilic granules containing histaminase were found in the blood smear. The nucleus consists of two segments. Identify these cells:**

1. neutrophils
2. eosinophils
3. basophils
4. monocytes
5. lymphocytes

**2. What kind of tissue are red blood cells formed from?**

1. myeloid tissue
2. lymphoid tissue
3. reticular tissue
4. bone tissue
5. mucous tissue

**3. What kind of tissue are granulocytes formed from?**

1. myeloid tissue
2. lymphoid tissue
3. reticular tissue
4. bone tissue
5. mucous tissue

**4. What kind of tissue are platelets formed from?**

1. myeloid tissue
2. lymphoid tissue
3. reticular tissue
4. bone tissue
5. mucous tissue

**5. What kind of tissue are lymphocytes formed from?**

1. myeloid tissue
2. lymphoid tissue
3. reticular tissue
4. bone tissue
5. mucous tissue

**6. What kind of tissue are monocytes formed from?**

1. myeloid tissue
2. lymphoid tissue
3. reticular tissue
4. bone tissue
5. mucous tissue

**7. Large cells containing a rounded nucleus were found in the blood smear. There are primary (azurophilic) granules in the cytoplasm. There is no specific granularity. Identify these cells:**

1. metamyelocytes
2. myelocytes
3. promyelocytes
4. mature basophils
5. monocyte

**8. Into which cells does the proerythrocyte differentiate?**

1. into the erythroblast
2. into the reticulocyte
3. into the red blood cell
4. into a monocyte
5. into erythrocyte



**9. Which cells does the erythroblast differentiate into?**

1. proerythrocyte
2. reticulocyte
3. red blood cell
4. monocyte
5. erythrocyte

**10. Into which cells does a reticulocyte differentiate?**

1. into an erythroblast
2. into the proerythrocyte
3. into the red blood cell
4. into a monocyte
5. into the promyelocytes

**11. Which cells directly form blood platelets:**

1. from promyelocytes
2. from normocytes
3. from megakaryocytes
4. from metamyelocytes
5. from promyelocytes

**12. Which neutrophilic cells normally mainly enter the blood?**

1. myelocytes
2. metamyelocytes
3. rod-shaped leukocytes
4. segmented leukocytes
5. promyelocytes

**13. Cells with a nucleus resembling the letter S. were found in the blood smear. Two types of granules with pink-purple color were found in the cytoplasm of cells. Identify these cells.**

1. segmented neutrophils
2. rod-shaped neutrophils
3. neutrophilic metamyelocyte
4. neutrophilic myelocyte
5. neutrophilic promyelocyte

**14. Name the cell common to cells of the myeloid and lymphoid series:**

1. megakaryoblast
2. proerythrocyte
3. promyelocyte
4. polypotent blood stem cell
5. prolymphocyte

**15. Which cells do monocytes differentiate into?**

1. macrophages
2. plasmocytes
3. lymphocytes
4. lipocytes
5. fibroblast

**16. Cells with oxyphilic granules were found in the blood smear. The nucleus is horseshoe-shaped. Identify these cells:**

1. segmented neutrophil
2. rod-shaped neutrophil
3. eosinophilic metamyelocyte
4. eosinophilic myelocyte
5. basophils

**17. What is the percentage of reticulocytes in peripheral blood?**

1. 1 %
2. 5 %
3. 8 %
4. 65 %
5. 20 %

**18. Cells with basophilic granules were found in the blood smear. The nucleus is horseshoe-shaped. Identify these cells:**

1. mature basophils
2. basophilic metamyelocyte
3. basophilic myelocytes
4. basophilic promyelocyte
5. eosinophilic myelocytes

**19. Which blood cells are called juvenile?**

1. myeloblast
2. promyelocyte
3. myelocyte
4. metamyelocyte
5. monocyte

**20. Cells multiply by mitosis. The cytoplasm contains primary and secondary (specific) granules. Identify these cells:**

1. myeloblast
2. promyelocyte
3. myelocyte
4. metamyelocyte
5. monocyte

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## TOPIC: «CONNECTIVE TISSUES»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure of loose, dense fibrous connective tissues and tissues with special properties, functional significance.

**The student should know:**

**Questions for preparation:**

1. Sources of development and histogenesis of connective tissues proper.
2. Classification of connective tissues.
3. General characteristics and functions of connective tissues.
4. Structure of loose fibrous irregular connective tissue (LFCT).
5. Cells of loose connective tissue.
6. The concept of macrophage system.
7. Intercellular substance.
8. Dense fibrous connective tissue.
9. Connective tissues with special properties (reticular, pigmented, mucous, adipose). Its structure, cellular composition and functional significance.
10. Regeneration of the actual connective tissue.

**The student should be able** to distinguish between different types of connective tissue.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. A thin layer of subcutaneous connective tissue from a rabbit.
2. Adipose tissue (whole mounts).
3. Tendon (transverse and longitudinal sections).

**Topics of abstract reports:**

1. Cellular elements of connective tissues and their participation in defense reactions of the organism.
2. Origin of intercellular substance.
3. Histogenesis and structure of pigment tissue.

## TEST TASKS

**1. Identify a cell that is capable of synthesizing fibrillar proteins (collagen, elastin):**

1. plasmocyte
2. fibrocyte
3. fibroblast
4. lipocyte
5. macrophage

**2. Which cell is involved in the formation of the basic substance and fibers?**

1. labrocyte
2. fibroblast
3. fibrocyte
4. pericyte
5. macrophage

**3. Which cell is capable of synthesizing a biologically active substance (pyrogene) that increases body temperature during inflammation?**

1. fibroblast
2. fibrocyte
3. plasmocyte
4. macrophage
5. labrocyte

**4. What is the name of the cell that transmits antigenic information to lymphocytes?**

1. monocyte
2. erythrocyte
3. macrophage
4. plasmocyte
5. fibroblast

**5. Which cell produces factors that stimulate lymphocyte differentiation?**

1. macrophage
2. lipocyte
3. fibrocyte
4. fibroblast
5. labrocyte

**6. Name a cell where the nucleus is located eccentrically, near the nucleus there is a light zone – “Light Yard”:**

1. lipocyte
2. fibrocyte
3. plasmocyte
4. labrocyte
5. fibroblast

**7. Which cells provide humoral immunity by synthesizing antibodies?**

1. lipocyte
2. plasmocyte
3. fibrocyte
4. labrocyte
5. fibroblast

**8. Name a cell in whose cytoplasm there are many granules having a reticulated, lamellar, crystalloid and mixed structure:**

1. lipocyte
2. plasmocyte
3. fibrocyte
4. labrocyte
5. fibroblast

**9. Which cell has a spherical shape, the nucleus is located sharply eccentrically in the form of a half moon, the center is occupied by a large drop of triglycerides:**

1. lipocyte
2. plasmocyte
3. fibrocyte
4. labrocyte
5. fibroblast

**10. Which connective tissue cells are involved in trophism?**

1. lipocyte
2. plasmocyte
3. fibrocyte
4. labrocyte
5. fibroblast

**11. Identify the cell that regulates local homeostasis:**

1. lipocyte
2. plasmocyte
3. fibrocyte
4. labrocyte
5. fibroblast

**12. What is the name of the cell that contains the substance melanin in its cytoplasm?**

1. plasmocyte
2. pigmentocyte
3. lipocyte
4. fibrocyte
5. fibroblast

**13. Which fibers contain an amorphous component in the center and a microfibrillar component on the periphery?**

1. collagen fiber
2. reticular fiber
3. elastic fiber
4. nerve fiber
5. ossein fiber

**14. Identify connective tissue with special properties that is found only in the embryo:**

1. pigmented tissue
2. reticular tissue
3. adipose tissue
4. mucous tissue
5. epithelial tissue

**15. Which connective tissue is represented in its structure by bundles of collagen fibers called bundles of the first, second, third and fourth orders:**

1. loose fibrous unformed connective tissue
2. dense fibrous unformed connective tissue
3. dense fibrous formed connective tissue
4. reticular tissue
5. adipose tissue

**16. Specify the connective tissue with special properties:**

1. dense fibrous unformed
2. dense fibrous formed
3. pigmented
4. loose fibrous unformed
5. epithelial

**17. Which of the connective tissues with special properties is the stroma of the hematopoiesis organs?**

1. pigmented
2. reticular
3. mucous
4. adipose
5. loose fibrous

**18. Which of the connective tissues with special properties protects the body from exposure to sunlight?**

1. pigmented
2. reticular
3. mucous membrane
4. adipose
5. loose fibrous

**19. Which organs include reticular tissue?**

1. skin
2. bone marrow
3. intestine
4. heart
5. tendon

**20. Which organs include dense fibrous formed connective tissue?**

1. skin
2. skeletal muscles
3. tendons
4. bone marrow
5. intestine

**21. A large number of granules are visible on the histological preparation next to the tissue basophils. What substances were released from the cells?**

1. melanin
2. heparin
3. keratin
4. collagen
5. elastin

**22. Cells with basophilic granularity are located around the capillaries. What are these cells called?**

1. fibrocyte
2. plasmocyte
3. labrocyte
4. melanocyte
5. fibroblast

**23. Which cells prevent blood clotting?**

1. fibrocyte
2. plasmocyte
3. labrocyte
4. melanocyte
5. fibroblast

**24. The skin color has changed under the influence of ultraviolet rays. Which connective tissue cells are involved in this reaction?**

1. fibrocyte
2. plasmocyte
3. labrocyte
4. melanocyte
5. fibroblast



**25. A live vaccine has been introduced into the human body. Which cells of loose fibrous connective tissue are involved in the development of specific immunity?**

1. fibrocyte
2. plasmocyte
3. labrocyte
4. melanocyte
5. fibroblast

**26. On the preparation of loose fibrous connective tissue, oval-shaped cells with a round nucleus are visible, the chromatin in which is arranged in the form of a wheel with spokes, and the granular endoplasmic reticulum is well developed. What are these cells called?**

1. fibrocyte
2. plasmocyte
3. labrocyte
4. melanocyte
5. fibroblast

**27. On the preparation shows oval-shaped cells in the form of empty cells with a flattened nucleus located near the cell membrane. What kind of cells are these?**

1. fibrocyte
2. plasmocyte
3. labrocyte
4. melanocyte
5. lipocytes

**28. The macrophage system includes:**

1. labrocytes
2. plasmocytes
3. lipocytes
4. macrophages
5. labrocyte

**29. Neural scallops are a source of development of:**

1. adventitious cells
2. adipose cells
3. pigment cells
4. plasma cells
5. lipocytes

**30. B – lymphocytes are the source of development of:**

1. adventitious cells
2. adipose cells
3. pigment cells
4. plasma cells
5. lipocytes

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## CONTROL QUESTIONS ON GENERAL TISSUES

1. Morphologic classification of epithelial tissue.
2. Genetic classification of epithelial tissues (according to N. G. Khlopin).
3. Simple epithelium (single-row, multirow).
4. Stratified epithelium (transitional, non-keratinizing, keratinizing).
5. Classification of exocrine glands by structure (simple, complex), by type of secretion (merocrine, apocrine, holocrine).
6. Blood, composition, functions.
7. Embryonic and post-embryonic hematopoiesis.
8. Erythrocytopoiesis, red blood cells, structure, types, function.
9. Granulocytopoiesis, granulocytes (neutrophils, eosinophils, basophils).
10. Agranulocytopoiesis, agranulocytes (monocytes, lymphocytes).
11. Thrombocytopoiesis, platelets.
12. Hemogram and leukocyte formula.
13. Classification of connective tissues.
14. Loose fibrous irregular connective tissue, cellular composition.
15. Dense connective tissue, types, structure of fibers (collagen, elastic).
16. Connective tissues with special characteristics.

## TOPIC: «CARTILAGE TISSUES»

**The purpose of the lesson:** to study the histogenesis, structure, and functions of cartilage tissues.

**The student should know:**

**Questions for preparation:**

1. General characteristics of cartilaginous tissues.
2. Classification of cartilaginous tissues.
3. Development of cartilage.
4. Cartilage cells (chondroblasts, chondrocytes), structure, functions.
5. Intercellular substance of cartilage.
6. Hyaline cartilage tissue, structure, function.
7. Elastic cartilage tissue, structure, function.
8. Fibrous cartilage tissue, structure, function.
9. Superciliary cartilage, its structure and functional significance.
10. Regeneration and age-related changes in cartilage tissue.

**The student should be able** to differentiate between different types of cartilage tissue.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Hyaline (vitreous) cartilage of rib.
2. Elastic (reticular) cartilage of auricle.
3. Collagenous fibrous cartilage.

**Topics of abstract reports:**

1. Growth, regeneration, and age-related changes in cartilage tissue.
2. Fibrous cartilage tissue of intervertebral discs.
3. Elastic cartilage of epiglottis, auricle.

## TEST TASKS

**1. In which of the listed tissues in the intercellular substance does the basic (amorphous) substance have the same refractive index as collagen fibers, which is why the fibers are not visible?**

1. elastic cartilage tissue
2. hyaline cartilage tissue
3. collagen-fibrous cartilage tissue
4. reticular tissue
5. bone tissue

**2. Name the source of cartilage tissue development:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**3. The preparation shows one of the connective tissues, in which there are no vessels of the microcirculatory bed. Name this tissue:**

1. loose fibrous unformed connective tissue
2. dense fibrous unformed connective tissue
3. cartilage tissue
4. bone tissue
5. reticular tissue

**4. In which connective tissue are the cells arranged in the form of isogenic groups?**

1. loose fibrous unformed connective tissue
2. dense fibrous unformed connective tissue
3. bone tissue
4. cartilage tissue
5. reticular tissue

**5. How are chondrocytes located in the zone of mature hyaline cartilage?**

1. single without capsule
2. single in a capsule
3. in the form of small isogenic groups
4. in the form of large isogenic groups
5. in the form of middle isogenic groups

**6. In which of the listed tissues does the intercellular substance contain collagen and elastic fibers?**

1. hyaline cartilage
2. fibrous cartilage
3. elastic cartilage
4. reticular tissue
5. bone tissue

**7. In which of the listed tissues are the cells arranged in the form of a "coin column":**

1. hyaline cartilage
2. fibrous cartilage
3. elastic cartilage
4. reticular tissue
5. bone tissue

**8. In which area of the cartilage are there blood vessels?**

1. the area of young cartilage
2. the zone of mature cartilage
3. the area of old cartilage
4. the perichondrium of cartilage
5. the intercellular substance of cartilage

**9. How are chondrocytes located in the area of old cartilage?**

1. singly without a capsule
2. single in a capsule
3. in the form of small isogenic groups
4. in the form of large isogenic groups
5. in the form of middle isogenic groups

**10. What type of cartilage cells has a well-developed granular endoplasmic reticulum (ergastoplasm)?**

1. chondroblast
2. the first type of chondrocytes
3. the second type of chondrocytes
4. the third type of chondrocyte
5. fibrocyte

**11. What type of cartilage cells has a well-developed smooth endoplasmic reticulum?**

1. chondroblast
2. the first type of chondrocytes
3. the second type of chondrocytes
4. the third type of chondrocytes
5. fibrocyte

**12. Which type of cartilage cells is characterized by a high nuclear-cytoplasmic ratio and is the source of reproduction of isogenic groups of cells?**

1. chondroblast
2. the first type of chondrocytes
3. the second type of chondrocytes
4. the third type of chondrocytes
5. fibrocyte

**13. Which cartilage cells provide peripheral (appositional) cartilage growth?**

1. chondroblast
2. the first type of chondrocytes
3. the second type of chondrocytes
4. the third type of chondrocytes
5. fibrocyte

**14. Which of the listed tissues forms the outer layer of the cartilage?**

1. loose fibrous unformed
2. dense fibrous unformed
3. dense fibrous formed
4. reticular tissue
5. adipose tissue

**15. Which cartilage cells provide interstitial cartilage growth?**

1. chondroblast
2. the first type of chondrocytes
3. the second type of chondrocytes
4. the third type of chondrocytes
5. fibrocyte

**16. Specify the types of cartilage tissues:**

1. elastic, coarse-fibrous, lamellar
2. hyaline, coarse-fibrous, lamellar
3. elastic, hyaline, collagen-fibrous
4. elastic, hyaline, lamellar
5. collagen-fibrous, coarse-fibrous, hyaline

**17. What cells are found in the perichondrium?**

1. chondrocytes
2. chondroblasts
3. osteocytes
4. osteoblasts
5. osteoclasts

**18. In which cartilage calcification never occurs?**

1. hyaline cartilage
2. elastic cartilage
3. fibrous cartilage
4. hyaline cartilage of articular surfaces
5. reticular tissue

**19. In which layer of cartilage tissue are chondroblasts located?**

1. the perichondrium of cartilage
2. the area of young cartilage
3. the zone of mature cartilage
4. the area of old cartilage
5. intercellular substance of cartilage

**20. In which cartilage is there no perichondrium?**

1. hyaline cartilage
2. elastic cartilage
3. fibrous cartilage
4. hyaline cartilage of the articular surface
5. reticular tissue

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## TOPIC: «BONE TISSUES»

**The purpose of the lesson:** to study the osteogenesis, structure, function, regeneration, and aging of bone tissues.

### *The student should know*

#### **Questions for preparation:**

1. General characterization of bone tissues.
2. Classification of bone tissue.
3. Osteogenesis directly (from the mesenchyme).
4. Osteogenesis indirectly (in place of cartilage).
5. Bone tissue cells (osteoblasts, osteocytes, osteoclasts), structure, functions.
6. Intercellular substance of bone.
7. Deep-fiber bone tissue.
8. Plate (spongy, compact) bone tissue.
9. Histological structure of tubular bone.
10. Regeneration and age-related changes in bone tissue.

*The student should be able* to differentiate between different types of bone tissue.

*The student should master* to microscope and analysis histologic slides.

#### **Demonstration slides:**

1. Development of bone from mesenchyme (lower jaw of an embryo).
2. Development of bone in place of hyaline cartilage (longitudinal section of finger phalanx).
3. Decalcified bone tissue (transverse section).
4. Longitudinal section of decalcified tubular bone.

#### **Topics of abstract reports:**

1. Bone as an organ.
2. Factors influencing bone development and growth.
3. Internal reorganization of bone tissue in the process of physiological regeneration.

## TEST TASKS

### **1. Determine the percentage of organic substances in the bone tissue:**

1. 3 %
2. 33 %
3. 67 %
4. 97 %
5. 20 %

**2. Determine the percentage of inorganic substances in the bone tissue:**

1. 3 %
2. 33 %
3. 67 %
4. 97 %
5. 20 %

**3. Name the source of bone tissue development:**

1. ectoderm
2. endoderm
3. splanchnotome
4. mesenchyme
5. nerve tube

**4. Name the source of osteoclast development:**

1. fibrocyte
2. osteocyte
3. monocyte
4. plasmocyte
5. chondrocyte

**5. Cells of various shapes are found in the bone tissue, and the granular endoplasmic reticulum is well developed in the cytoplasm. The nucleus is located excentrically. Identify these cells:**

1. osteoblast
2. osteocyte
3. osteoclast
4. fibroblast
5. fibrocyte

**6. Which fibers are called the intercellular substance of bone tissue?**

1. elastic fibers
2. collagen fibers
3. ossein fibers
4. reticular fibers
5. nerve fibers

**7. Multinucleated cells containing numerous lysosomes have been found in bone tissue. Name these cells:**

1. osteoblasts
2. osteoclasts
3. osteocytes
4. fibroblasts
5. fibrocytes

**8. Which bone cell has a regrowth shape, a large nucleus, and no centrioles?**

1. osteoblast
2. osteoclast
3. osteocyte
4. fibroblast
5. fibrocytes

**9. In which of the listed tissues do collagen fibers lie parallel to each other in orderly arranged bone plates?**

1. coarse-fibrous bone tissue
2. compact lamellar bone tissue
3. spongy lamellar bone tissue
4. dense fibrous formed connective tissue
5. reticular tissue

**10. In which of the listed tissues is the osteon a structural unit?**

1. coarse-fibrous bone tissue
2. spongy lamellar bone tissue
3. compact lamellar bone tissue
4. dense fibrous formed connective tissue
5. reticular tissue

**11. Which of the listed supporting tissues consists of three layers: the outer layer of common plates, the middle one formed by plates concentrically layered around the vessels, and the inner layer of common plates?**

1. coarse-fibrous bone tissue
2. compact lamellar bone tissue
3. spongy lamellar bone tissue
4. hyaline cartilage tissue
5. elastic cartilage tissue

**12. In which layer of compact lamellar bone tissue is the Haversian canal located?**

1. the outer layer of common plates
2. the middle layer of common plates
3. the inner layer of common plates
4. endosteum
5. periosteum

**13. In which layer of compact lamellar bone tissue are osteoblasts located?**

1. the outer layer of common plates
2. the middle layer of common plates
3. the inner layer of common plates
4. endosteum
5. periosteum

**14. In which of the listed tissues do collagen fibers lie parallel to each other in randomly arranged bone plates?**

1. coarse-fibrous bone tissue
2. compact lamellar bone tissue
3. spongy lamellar bone tissue
4. dense fibrous formed connective tissue
5. reticular tissue

**15. In which of the listed tissues do collagen fibers have a disordered direction?**

1. coarse-fibrous bone tissue
2. spongy lamellar bone tissue
3. compact lamellar bone tissue
4. dense fibrous formed connective tissue
5. epithelial tissue

**16. Which of the listed tissues forms the outer (fibrous) periosteum layer?**

1. loose fibrous unformed
2. dense fibrous unformed
3. dense fibrous formed
4. reticular tissue
5. epithelial tissue

**17. Which cells predominantly form the inner (cambial) layer of the periosteum?**

1. osteoblasts
2. osteoclasts
3. osteocytes
4. fibroblasts
5. fibrocytes

**18. What cells are found in the periosteum?**

1. erythrocytes
2. chondroblasts
3. osteocytes
4. osteoblasts
5. osteoclasts

**19. Which of the listed tissues forms the endosteum of the bone?**

1. loose fibrous unformed
2. dense fibrous unformed
3. dense fibrous formed
4. reticular
5. epithelial tissue

**20. Which cells ensure the destruction of bone tissue?**

1. osteoblasts
2. osteocytes
3. osteoclasts
4. fibroblasts
5. fibrocytes

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## TOPIC: «MUSCLE TISSUES»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure, functions of muscle tissues.

**The student should know:**

**Questions for preparation:**

1. General characteristics of muscle tissues.
2. Classification – morpho-functional and histogenetic.
3. Smooth muscle tissue, its varieties.
4. Smooth muscle tissue itself, histogenesis, structure, function, regeneration.
5. Myoepithelial muscle tissue, histogenesis, structure, function.
6. Myoneural muscle tissue, histogenesis, structure, their varieties and structural and functional differences.
7. Striated muscle tissues, their varieties and structural and functional differences.
8. Skeletal muscle tissues, histogenesis, morpho-functional characterization.
9. Cardiac muscle tissue, histogenesis, morpho-functional characterization, types of cardiomyocytes.
10. Muscle as an organ, structure, function, regeneration.

**The student should be able** to differentiate between different types of muscle tissue.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Smooth muscle of bladder (longitudinal and transverse sections).
2. Striated muscle tissue of tongue (transverse section).
3. Striated muscle of heart.

**Topics of abstract reports:**

1. Structure of muscle as an organ.
2. Histogenesis, regeneration and transplantation of skeletal muscle.
3. Conditions for regeneration of muscle tissue.

## TEST TASKS

**1. Which muscle tissue is the source of development of the mesenchyme?**

1. smooth muscle tissue
2. cardiac muscle tissue
3. skeletal muscle tissue
4. myoepithelial muscle tissue
5. myoneural muscle tissue

**2. What kind of muscle tissue develops from splanchnotome of the mesoderm?**

1. smooth muscle tissue
2. cardiac muscle tissue
3. skeletal muscle tissue
4. myoepithelial muscle tissue
5. myoneural muscle tissue

**3. What kind of muscle tissue develops from somites of the mesoderm?**

1. smooth muscle tissue
2. cardiac muscle tissue
3. skeletal muscle tissue
4. myoepithelial muscle tissue
5. myoneural muscle tissue

**4. Which of the listed muscle tissues develops from the skin ectoderm?**

1. smooth muscle tissue
2. cardiac muscle tissue
3. skeletal muscle tissue
4. myoepithelial muscle tissue
5. myoneural muscle tissue

**5. What kind of muscle tissue is the neural tube the source of development?**

1. smooth muscle tissue
2. cardiac muscle tissue
3. skeletal muscle tissue
4. myoneural muscle tissue
5. myoepithelial muscle tissue

**6. What are the compounds in smooth muscle tissue that ensure the functional interactions of myocytes in the tissue?**

1. desmosome
2. simple connection
3. nexus
4. by type of lock
5. dense connection

**7. In which muscle tissues does physiological regeneration occur in the form of compensatory hypertrophy?**

1. smooth muscle tissue
2. skeletal muscle tissue
3. myoepithelial muscle tissue
4. myoneural muscle tissue
5. striated muscle tissue

**8. Identify the muscle tissue cells if they are located in the glands, have a stellate shape, and the contractile apparatus is located in the appendages:**

1. cardiomyocytes
2. myoepitheliocytes
3. myocytes
4. myosymplasts
5. myoblasts

**9. In which muscle tissue are there satellites involved in regeneration?**

1. skeletal muscle tissue
2. cardiac muscle tissue
3. smooth muscle tissue
4. myoepithelial muscle tissue
5. myoneural muscle tissue

**10. In which muscle tissue is the fiber formed by the symplast and satellite cells the main element?**

1. smooth muscle tissue
2. skeletal muscle tissue
3. cardiac muscle tissue
4. myoepithelial muscle tissue
5. myoneural muscle tissue

**11. What is the shape of contractile cardiomyocytes?**

1. fusiform shape
2. star shape
3. oval shape
4. cylindrical shape
5. stellate shape

**12. Which muscle tissue cell has a cylindrical shape, a nucleus in the center, well-developed mitochondria and cells are interconnected by intercalated disk?**

1. myocyte
2. cardiomyocyte
3. myoepitheliocyte
4. satellite cell
5. myosymplast

**13. What kind of muscle tissue contains myofibrils with transverse striation?**

1. skeletal muscle tissue
2. smooth muscle tissue
3. myoepithelial muscle tissue
4. myoneural muscle tissue
5. non-striated muscle tissue



**14. Which electrolytes are involved in the histophysiology of muscle tissue contraction?**

1. sodium ions
2. potassium ions
3. calcium ions
4. chlorine ions
5. iodine ions

**15. In which muscle tissues do deep indentations called T-tubules form?**

1. skeletal muscle tissue
2. smooth muscle tissue
3. myoepithelial muscle tissue
4. myoneural muscle tissue
5. non-striated

**16. Which muscle tissue contracts slowly, tonally and almost tirelessly?**

1. cardiac
2. skeletal
3. smooth
4. somatic
5. striated

**17. In which tissues are there layers of connective tissue bearing the following names: endomysium, perimysium and epimysium?**

1. nervous tissue
2. muscle tissue
3. bone tissue
4. cartilage tissue
5. connective tissue

**18. Identify the tissue in which the areas between the two telophragmas, called sarcomeres, meet:**

1. smooth muscle tissue
2. skeletal muscle tissue
3. bone tissue
4. cartilage tissue
5. connective tissue

**19. Smooth muscle tissue is a part of the following organs:**

1. the adrenal gland
2. the brain
3. the intestines
4. the heart
5. the tongue

**20. In the structural and functional units of muscle tissue there is an organoid of special significance:**

1. myofibrils
2. neurofibrils
3. tonofibrils
4. flagella
5. cilia

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## TOPIC: «NERVOUS TISSUE»

**The purpose of the lesson:** to study the origins, histogenesis, structure and function of nervous tissue.

**The student should know:**

**Questions for preparation:**

1. Morpho-functional characterization of nerve tissue.
2. Development of nervous tissue.
3. Neurons, classification.
4. Structural and functional characterization of neurons.
5. Special organelles in neurons, their functional significance.
6. Neuroglia, classification.
7. Development, structure, functions of neuroglia.
8. Myelinated and unmyelinated nerve fibers, structure, functions, regeneration.
9. Process of myelination, concept of mesaxon.
10. Nerve endings (sensory, motor, synaptic), classification, morpho-functional characterization.

**The student should be able** to distinguish between types of nerve fibers.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Tigroid in the cytoplasm of spinal motor neurons.
2. Nonmyelinated nerve fibers.
3. Isolated myelinated nerve fibers.

**Topics of abstract reports:**

1. Skeletal muscle receptors.
2. Motor nerve endings (motor plaques).
3. Regeneration of nerve fibers.

## TEST TASKS

**1. Neurons develop from:**

1. mesenchyme
2. mesoderm
3. endoderm
4. neural tube
5. ectoderm

**2. Which neuroglia is the source of development of mesenchyme?**

1. ependymoglia
2. astroglia
3. microglia
4. oligodendroglia
5. Schwann cell

**3. The marginal veil in the developing neural tube consists of:**

1. neurons
2. processes of neurons
3. macroglia
4. microglia
5. ependymoglia

**4. Neurofibrils in a neuron perform the following functions:**

1. protective
2. trophic
3. the reference
4. conducting the pulse
5. isolated

**5. In conducting nervous excitation through nerve cells, the following takes part:**

1. neurofibrils
2. synaptic vesicles
3. lysosomes
4. ergastoplasm
5. mitochondria

**6. The structures of the myelin sheath of the nerve fiber are represented by:**

1. ependymocytes
2. astrocytes
3. oligodendrogliaocytes
4. microglia
5. Gortega cells

**7. The main role in the regeneration of nerve fibers belongs to:**

1. microglia
2. ependymoglia
3. astroglia
4. oligodendroglia
5. Gortega cells

**8. How many axons does a multipolar neuron have?**

1. one
2. two
3. three
4. four
5. five

**9. How many dendrites does a pseudounipolar neuron have?**

1. one
2. two
3. three
4. four
5. five

**10. In a neuron, the tigroid is represented by the structure:**

1. Golgi apparatus
2. granular endoplasmic reticulum
3. neurofibrils
4. synaptic vesicles
5. mitochondria

**11. A rough connective tissue scar has developed at the site of the nerve fiber cutting. How will the regeneration of the nerve fiber go?**

1. regeneration is accelerated
2. regeneration is slowed down
3. there will be no regeneration
4. normal recovery
5. degeneration

**12. The drug contains a receptor, a branched terminal surrounded by lemmocytes and a capsule. Name the receptor:**

1. free nerve ending
2. the bushy nerve ending
3. a non-free, non-encapsulated nerve ending
4. a non-free, encapsulated nerve ending
5. Merkels cell

**13. Which special-purpose organoids determines the neuron?**

1. cilia
2. synaptic vesicles
3. microvilli
4. myofibrils
5. tonofibrils

**14. Muscle spindles by functional type belong to:**

1. motor
2. associative
3. sensitive
4. neurosecretory
5. trophic

**15. The neuroglia forming the inner lining of the ventricles of the brain is called:**

1. ependymocyte
2. astrocyte
3. oligodendrogliaocyte
4. microglial cell
5. Gortega ctlls

**16. The neurons of the autonomic ganglia develop from:**

1. endoderm
2. mesoderm
3. neural tubes
4. ganglion plates
5. dermatome

**17. Name the sections of myelin nerve fiber devoid of myelin according to the author:**

1. Betz intercepts
2. Ranvier intercepts
3. Purkinje intercepts
4. Schwann intercepts
5. Gortega intercepts

**18. Which nerve fiber conducts an impulse at a speed of up to 120 m/sec?**

1. myelin
2. myelin-free
3. elastic
4. collagen
5. reticular

**19. Name the glial macrophage according to the author:**

1. Purkinje cells
2. Betz cells
3. Gortega cells
4. Schwann cells
5. Ranvier cells

**20. Specify the glial macrophage:**

1. oligodendroglia
2. astroglia
3. ependymoglia
4. microglia
5. Schwann cells

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## **CONTROL QUESTIONS ON SPECIAL TISSUES**

1. Cartilaginous tissues, sources of development, classification, functions.
2. Cellular composition of cartilaginous tissues.
3. Structure of hyaline, elastic, fibrous cartilage.
4. Bone tissues, classification, function.
5. Direct and indirect osteogenesis.
6. Cellular composition of bone tissue.
7. Structure of coarse fiber and lamellar bone tissue.
8. Muscle tissues, classification, functions.
9. Myogenesis, regeneration.
10. Skeletal muscle tissues (apparatuses), structure.
11. Nervous tissue, composition.
12. Development of nervous tissue, stages of development.
13. Classification and structure of nerve cells.
14. Classification and structure of neuroglia.
15. Nerve fibers, development, types, structure.
16. Morpho-functional classification of nerve endings.



## SECTION 4. PRIVATE HISTOLOGY

### TOPIC: «NERVOUS SYSTEM»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure, functions of the organs of the nervous system.

**The student should know:**

**Questions for preparation:**

1. General morpho-functional characteristics of the nervous system, classification.
2. Peripheral nervous system, organs.
3. Spinal ganglia: development, structure, functions.
4. Vegetative ganglia: development, structure, functions.
5. Central nervous system, organs.
6. Sources and course of development of the nervous system.
7. Spinal cord: tissue composition of white and grey matter, functions of the nucleus of grey matter, gliocytes.
8. Cerebellum, structure, neural composition of the cerebellar cortex, afferent and efferent nerve fibers, functional significance.
9. Cortex of the cerebral hemispheres, types of neurons and cytoarchitectonics of cortical layers.
10. Myeloarchitectonics, blood-brain barrier (BBB), structure, functions.

**The student should be able** to differentiate the organs of the nervous system.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Spinal ganglion.
2. Spinal cord.
3. The cerebral cortex of the human brain.
4. Cerebellum.

**Topics of abstract reports:**

1. Principle of structure and functional role of histological barriers.
2. Inter-neuronal connections of the cerebellum.
3. The concept and modules and their constituent cell systems of the cortex of the hemispheres of the brain.

## TEST TASKS

### **1. Pseudounipolar neurons are found in:**

1. cerebellum
2. spinal cord
3. spinal ganglion
4. cerebral cortex
5. autonomic ganglion

### **2. Dogiel cells are located in:**

1. spinal cord
2. spinal ganglion
3. cerebellum
4. autonomic ganglion
5. cerebral cortex

### **3. Clark's nucleus is located in the spinal cord in:**

1. anterior horns
2. lateral horns
3. posterior horns
4. lateral root
5. anterior root

### **4. The motor neurons of the spinal cord are located in:**

1. anterior horns
2. lateral horns
3. posterior horns
4. lateral root
5. lateral root

### **5. The spinal canal cavity is lined with cells called:**

1. astrocytes
2. ependymocytes
3. oligodendrocytes
4. microglia
5. lemmocytes

### **6. Betz cells are located in:**

1. spinal cord
2. spinal ganglion
3. cerebellum
4. cerebral cortex
5. autonomic ganglion

**7. Which layer of the cerebral cortex contains cells of diverse shapes?**

1. molecular
2. ganglionic
3. polymorphic
4. pyramidal
5. nuclear

**8. The layer of the cerebral cortex that contains large pyramidal-shaped neurons:**

1. molecular
2. ganglionic
3. polymorphic
4. pyramidal
5. nuclear

**9. The anterior horns of the spinal cord contain:**

1. sensory neurons
2. associative neurons
3. motor neurons
4. secretory neurons
5. afferent neurons

**10. Purkinje cells are located in:**

1. spinal cord
2. spinal ganglion
3. cerebellum
4. cerebral cortex
5. autonomic ganglion

**11. The axons of basket neurons in the cerebellum form synapses with:**

1. Betz cells
2. Dogel cells
3. Purkinje cells
4. Golgi cells
5. Gortega cells

**12. The axons of basket neurons in the cerebellum form synapses with:**

1. stellate cells
2. horizontal cells
3. granule cells
4. pyramidal cells
5. pear-shaped cells

**13. The layer of Betz cells (ganglionic) is formed by neurons that are:**

1. stellate
2. horizontal
3. pyramidal
4. pear-shaped
5. granule

**14. The surface layer of the cerebellum is called:**

1. molecular
2. ganglionic
3. granular
4. polymorphic
5. pyramidal

**15. Climbing fibers in the cerebellum terminate on neurons that are:**

1. basket cells
2. pear-shaped cells
3. stellate cells
4. horizontal cells
5. pyramidal cells

**16. Excitation from mossy fibers is transmitted to Purkinje cells by:**

1. basket cells
2. stellate cells
3. granule cells
4. Golgi cells
5. pyramidal cells

**17. The arachnoid membrane of the spinal cord is formed by:**

1. loose fibrous irregular connective tissue
2. reticular tissue
3. dense fibrous irregular connective tissue
4. dense fibrous regular connective tissue
5. mucous tissue

**18. The dura mater is formed by:**

1. loose fibrous irregular connective tissue
2. reticular tissue
3. dense fibrous irregular connective tissue
4. dense fibrous regular connective tissue
5. mucous tissue

**19. The membrane adjacent to the white matter of the spinal cord is called:**

1. dura mater
2. pia mater
3. arachnoid
4. perineurium
5. epineurium

**20. Pseudounipolar neurons in the spinal ganglion are surrounded by:**

1. astrocytes
2. ependymal cells
3. oligodendrocytes
4. microglia
5. Gortega cells

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## TOPIC: «SENSORY ORGANS»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure of sensory organs.

**The student should know:**

**Questions for preparation:**

1. Sensory organs: general morpho-functional characteristic, classification, the concept of analyzers.
2. Primary sensory organs. Development of the organ of vision.
3. Morpho-functional characteristic, structure of the organ of vision.
4. Structure of the receptor apparatus of the eye.
5. Age-related changes in the organ of vision.
6. Olfactory organ: development, structure, cytophysiology of chemoreception.
7. Secondary sensory organs. Development of the organ of hearing and balance.
8. Structure of the organ of hearing and balance.
9. Principle of structure of receptor compartments and their histophysiology, age-related changes.
10. The organ of taste: development, structure and histophysiology.

**The student should be able** to differentiate the various sensory organs.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Cornea of the eye.
2. The wall of the eyeball.
3. Incision through the cochlear canal with the spiral organ.
4. Taste buds of the leaf-shaped papilla of the tongue.

**Topics of abstract reports:**

1. Vomeronasal organ.
2. Theories of visual perception, visual impairment.
3. Theories of sound perception, hearing disorders.

## TEST TASKS

**1. Which cells of the organ of Corti are secondary sensory receptor cells?**

1. pillar cells
2. supporting cells
3. hair cells
4. cells of the stria vascularis
5. spiral ganglion cells

**2. What type of epithelium lines the vestibular part of the membranous labyrinth?**

1. simple squamous epithelium
2. pseudostratified columnar epithelium
3. stratified non-keratinized squamous epithelium
4. stratified transitional epithelium
5. simple cuboidal epithelium

**3. Which cells of the spiral organ lie on the basement membrane?**

1. outer hair cells
2. supporting cells
3. inner hair cells
4. cells of the stria vascularis
5. spiral ganglion cells

**4. Which cells of the organ of Corti form the tunnel?**

1. outer supporting cells
2. inner supporting cells
3. pillar cells
4. hair cells
5. spiral ganglion cells

**5. In which part of the ear is the organ of balance located?**

1. outer ear
2. middle ear
3. cochlea
4. vestibular labyrinth
5. osseous labyrinth

**6. Where are the auditory crests located?**

1. utricle
2. saccule
3. ampulla
4. spiral ganglion
5. spiral ligament

**7. Which organelle of special significance in the receptor cells of the equilibrium organ is mobile?**

1. stereocilia
2. kinocilium
3. flagella
4. microvilli
5. tonofibrils

**8. Which organelle of special significance in the receptor cells of the equilibrium organ is immobile?**

1. stereocilia
2. kinocilium
3. flagella
4. microvilli
5. tonofibrils

**9. In experimental animals, receptor cells of the auditory crests in the ampullae of the semicircular canals are damaged. Which function is impaired?**

1. linear accelerations
2. vibration
3. angular accelerations (turns of the body, head)
4. gravity
5. oscillation

**10. Which cells of the spiral organ transmit excitation to the spiral ganglion?**

1. pillar cells
2. outer supporting cells
3. hair cells
4. inner supporting cells
5. Deiters cells

**11. Name the organelle of special significance in the receptor cells of the organ of Corti?**

1. kinocilia
2. flagella
3. microvilli
4. neurofibrils
5. tonofibrils

**12. In which part of the cochlea is the organ of Corti located?**

1. tympanic duct
2. vestibular duct
3. membranous canal
4. spiral ganglion
5. Eustachian tube

**13. In which part of the ear is the organ of Corti located?**

1. outer ear
2. middle ear
3. cochlea
4. system of semicircular canals
5. Eustachian tube



**14. A person has impaired mesopic vision (“night blindness”). Which cells’ function is impaired?**

1. cones
2. rods
3. horizontal cells
4. amacrine cells
5. Muller cells

**15. A person has impaired color vision (“color blindness”). Which cells’ function is impaired?**

1. cones
2. rods
3. horizontal cells
4. amacrine cells
5. Muller cells

**16. As a result of accidental ingestion of acetic acid (vinegar), a patient has atrophied taste buds on the front part of the tongue. Which taste sensations are lost?**

1. sweet
2. salty
3. sour
4. bitter
5. mixed

**17. Which special organelle do olfactory cells have?**

1. microvilli
2. cilia
3. neurofibrils
4. tonofibrils
5. myofibrils

**18. How many neurons make up the eye’s receptor apparatus?**

1. one
2. two
3. three
4. four
5. five

**19. Which of the following types of epithelium is related to the anterior epithelium of the cornea of the eye?**

1. simple squamous
2. pseudostratified
3. stratified keratinized
4. stratified non-keratinized
5. simple cuboidal

**20. What is the source of development for the substance of the cornea of the eye?**

1. endoderm
2. ectoderm
3. mesoderm
4. mesenchyme
5. nerve tube

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## TOPIC: «CARDIOVASCULAR SYSTEM»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure of the blood and lymphatic vessels and the heart.

### **Student should know**

#### **Questions for preparation:**

1. Morpho-functional characterization of the cardiovascular system.
2. Sources of development of the heart, blood, and lymphatic vessels.
3. Classification of arteries, structure of arteries of different types.
4. Classification of veins, structure of veins of different types.
5. Microcirculatory bed: connections and functions.
6. Structure and functions of capillaries, their classification.
7. Lymphatic vessels: their functions and structural characteristics.
8. Structure of heart - endocardium, myocardium, epicardium. Pericardium.
9. Conductive system of heart. Morphologic features of atypical tissues, structure, functions.
10. Age-related changes in vessels and cardiac wall.

**The student should be able** to differentiate between different types of vessels and of the heart wall.

**The student should master** to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Capillaries, arterioles and venules of the soft dura mater of the brain.
2. Muscular artery (femoral artery).
3. Vein.
4. Heart.

#### **Topics of abstract reports:**

1. Classification and morphology of arteriolo-venular anastomoses, their regional peculiarities.
2. Vessels, their morphology in relation to physical activity.
3. Age-related remodeling and regeneration of blood vessels.

## TEST TASKS

**1. In muscular-type veins with low content of muscle elements, smooth muscle cells are located in:**

1. outer layer
2. middle layer
3. inner layer
4. all layers
5. no layers

**2. Cardiomyocytes are found in:**

1. artery
2. vein
3. heart
4. capillary
5. arterioles

**3. The endocardium develops from:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**4. The myocardium develops from:**

1. sclerotome
2. dermatome
3. myotome
4. splanchnotome
5. mesenchyme

**5. Contractile cardiomyocytes contain:**

1. striated myofibrils
2. smooth myofibrils
3. tonofibrils
4. neurofibrils
5. microvilli

**6. The conducting system cells of the heart (atypical cardiomyocytes) contain:**

1. striated myofibrils
2. smooth myofibrils
3. tonofibrils
4. neurofibrils
5. microvilli

**7. In the cleavage of the basal membrane of capillary walls, there are:**

1. myocytes
2. lipocytes
3. pericytes
4. adventitial cells
5. plasmocytes

**8. In the wall of an elastic-type artery, are found:**

1. striated myocytes
2. fenestrated elastic membranes
3. pericytes
4. pigment cells
5. lipocytes

**9. The microcirculatory bed includes:**

1. arteries
2. veins
3. hemocapillaries
4. heart
5. aorta

**10. Hemocapillaries have:**

1. one layer
2. two layers
3. three layers
4. four layers
5. five

**11. What are the sources of heart development?**

1. ectoderm, endoderm
2. ectoderm, mesoderm
3. mesoderm, mesenchyme
4. ectoderm, mesoderm
5. endoderm, mesenchyme

**12. The first blood vessels are formed in:**

1. amnion
2. allantois
3. chorion
4. yolk sac
5. serous membrane

**13. Pericytes perform the following function:**

1. trophic
2. contractile
3. supportive
4. cambial
5. protect

**14. How are arteries classified based on morphological criteria?**

1. elastic, muscular, mixed
2. muscular, non-muscular, mixed
3. fibrous, muscular, mixed
4. elastic, fibrous, muscular
5. elastic, fibrous, mixed

**15. How are veins classified based on morphological principles?**

1. elastic, muscular
2. non-muscular, muscular
3. elastic, non-muscular
4. fibrous, elastic
5. fibrous, muscular

**16. Elastic membranes are found only in:**

1. veins
2. capillaries
3. arteries
4. venules
5. lymphatic vessels

**17. The outer elastic membrane is found only in:**

1. venules
2. arteries
3. arterioles
4. capillaries
5. veins

**18. In muscular-type veins with well-developed muscle elements, smooth muscle cells are located in:**

1. inner layer
2. middle layer
3. outer layer
4. all layers
5. no layers

**19. In muscular-type veins, bundles of circularly arranged smooth muscle cells are found in:**

1. inner layer
2. middle layer
3. outer layer
4. all layers
5. no layers

**20. Elastic terminal membranes are found only in:**

1. elastic-type arteries
2. muscular-type arteries
3. mixed-type arteries
4. arterioles
5. venules

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## **TOPIC: «ORGANS OF HEMATOPOIESIS AND IMMUNOLOGICAL DEFENSE»**

**The purpose of the lesson:** to study the sources of development, histogenesis, structure of organs of hematopoiesis

### **The student should know**

#### **Questions for preparation:**

1. Morpho-functional characterization of hematopoietic and immune organs.
2. Classification of hematopoietic organs.
3. Embryonic development of hematopoietic organs.
4. Bone marrow, types, structure, functions.
5. Concept of myeloid and lymphoid tissues, stroma and parenchyma.
6. Thymus, structure, functions, thymic involution and types.
7. Lymph nodes, structure, functions.
8. Structural elements of cortical and cerebral substance of lymph node. Lymph nodes, T- and B-dependent zones.
9. Spleen, structure of white and red pulp, T- and B-dependent zones.
10. Features of the circulatory theory of the spleen.

**The student should be able** to differentiate the various organs of hematopoiesis.

**The student should master** to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Red bone marrow.
2. Spleen.
3. Lymph node.
4. Thymus

#### **Topics of abstract reports:**

1. Cellular interactions in immune response.
2. Lymphoid follicles of the gastrointestinal tract, structure, functions.
3. Age-related changes in hematopoietic organs.

## **TEST TASKS**

### **1. The stroma of red bone marrow is formed by:**

1. mucous tissue
2. reticular tissue
3. epithelial tissue
4. adipose tissue
5. loose connective tissue



**2. The stroma of the thymus is formed by:**

1. mucous tissue
2. reticular tissue
3. epithelial tissue
4. adipose tissue
5. loose connective tissue

**3. The stroma of the spleen is formed by:**

1. mucous tissue
2. reticular tissue
3. epithelial tissue
4. adipose tissue
5. loose connective tissue

**4. The stroma of a lymph node is formed by:**

1. mucous tissue
2. reticular tissue
3. epithelial tissue
4. adipose tissue
5. loose connective tissue

**5. The stratified squamous epithelium forms the stroma of:**

1. lymph node
2. spleen
3. red bone marrow
4. thymus
5. yellow bone marrow

**6. In which organ does a central artery exist in the lymphatic follicle?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**7. In which organ is the parenchyma represented by white and red pulp?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**8. In the parenchyma of which organ do lymphatic follicles form pulp?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**9. What is “white pulp” of the spleen?**

1. accumulation of neutrophils
2. accumulation of monocytes
3. accumulation of lymphocytes
4. accumulation of platelets
5. accumulation of erythrocytes

**10. Which of the listed hematopoietic organs is covered externally by mesothelium?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**11. In which of the listed organs is the parenchyma represented by myeloid tissue?**

1. spleen
2. thymus
3. lymph nodes
4. bone marrow
5. skin

**12. An organ covered externally by mesothelium, with a stroma of reticular tissue, and parenchyma represented by white and red pulp. What organ is this?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**13. In which of the listed organs do lymphocytes form follicles located in the cortical substance and cords of lymphocytes extending toward the center in the medullary substance?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**14. What is the developmental source of the thymus?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**15. In the stroma of which organ are Hassall's corpuscles (concentric layers of epithelial cells) located?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**16. The stroma of an organ consists of reticular tissue, and the parenchyma contains all types of blood cells at various stages of development. What organ is this?**

1. spleen
2. thymus
3. lymph nodes
4. bone marrow
5. skin

**17. The stroma of an organ consists of reticular tissue, and the parenchyma is made up of lymphoid follicles located in the cortical substance and medullary (lymphoid) cords. What organ is this?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**18. The stroma of an organ is formed by epithelial tissue, and the parenchyma consists of lymphocytes forming cortical (dark) and medullary (light) substance. What organ is this?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**19. In the connective tissue capsule of which organ is a small number of smooth muscle cells located?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

**20. In the parenchyma of which organ do accumulations of erythrocytes and numerous blood vessels form red pulp?**

1. spleen
2. thymus
3. lymph nodes
4. red bone marrow
5. yellow bone marrow

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## TOPIC: «ENDOCRINE SYSTEM»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure, functions of the organs of the endocrine system.

### *The student should know*

#### **Questions for preparation:**

1. Morpho-functional characteristics of endocrine glands, difference from exocrine glands.
2. Classification of endocrine organs.
3. The concept of hormones, endocrine cells.
4. Morpho-functional characterization of the hypothalamus, development, structure, releasing factors (membranes, statins).
5. Pituitary gland, development, morpho-functional characterization of adenocytes (basophils, acidophils, chromophobes), structure and function of the pituitary gland.
6. Epiphysis, development, structure, age-related changes.
7. Thyroid gland, sources of development, structure, follicle, phases, secretory cycle, follicular reorganization in relation to the different functional activity of the interfollicular islands.
8. Parathyroid glands: sources of development, structure and cellular and cellular composition, function.
9. Adrenal glands: development, morphofunctional characterization of cortical and cortical and cerebral substance, hormonal functions.
10. Diffuse endocrine system, the idea of the ARID system.

*The student should be able* to differentiate the organs of the endocrine system.

*The student should master* to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Thyroid and parathyroid glands.
2. Parathyroid gland.
3. Pituitary gland.
4. The adrenal gland.

#### **Topics of abstract reports:**

1. Morphology of the adrenal glands in adaptation syndrome.
2. Age-related features of the thyroid gland.
3. The role of the pituitary gland and adrenal glands under stress.

## TEST TASKS

**1. In an organ, a distinction is made between cerebral and cortical matter. In the cortex there are 3 zones: tubular, fascicular, reticular. Which organ is this?**

1. pituitary gland
2. thyroid gland
3. parathyroid gland
4. adrenal gland
5. hypophysis

**2. What is the effect of parathyroid hormone?**

1. hypocalcemic
2. hypercalcemic
3. hyponatremic
4. hypernatremic
5. no effect

**3. Which cells in the thyroid gland produce hormones that effect the body's metabolism?**

1. thyrocytes
2. calcitonin cells
3. fibrocytes
4. fibroblasts
5. parafollicular cells

**4. What is the effect of calcitonin?**

1. hypocalcemic
2. hypercalcemic
3. hyponatremic
4. hypernatremic
5. no effect

**5. Which thyroid cells produce hormones that effect mineral metabolism in the body?**

1. thyrocytes
2. calcitonin cells
3. fibrocytes
4. fibroblasts
5. follicular cells

**6. The organ is externally covered by a capsule, has a lobular structure and is rich in blood vessels. The parenchyma is represented by true follicles, the height of which may vary according to the functional activity of the organ. What kind of organ is it?**

1. pituitary gland
2. thyroid gland
3. parathyroid gland
4. adrenal gland
5. hypophysis

**7. The parenchymal part of the organ is represented by epithelial strands, between which there is a dense network of sinusoidal capillaries of fenestrated type. Cells are divided into chromophilic and chromophobic cells. What part of the pituitary gland is described?**

1. anterior
2. middle
3. tuberal
4. posterior
5. intermedia

**8. Which hormone of the adenohypophysis affects the activity of the sex glands?**

1. lactotropic
2. somatotropic
3. gonadotropic
4. thyrotropic
5. adrenocorticotropic

**9. Which of the following is an acidophilic cell of the adenohypophysis?**

1. somatotropocyte
2. thyrotropocyte
3. gonadotropocyte
4. adrenocorticotropocyte
5. folliculotropocytes

**10. Which part of the pituitary gland is called the neurohypophysis?**

1. anterior
2. middle
3. tuberal
4. posterior
5. intermedia

**11. Which part of the pituitary produces melanotropic and lipotropic hormones?**

1. anterior
2. middle
3. tuberal
4. posterior
5. dorsal

**12. In which part of the pituitary gland are the accumulation corpuscles or Herring's corpuscles located in contact with capillaries?**

1. anterior
2. middle
3. tuberal
4. posterior
5. intermedia

**13. In which endocrine organ do the hypothalamic hormones: oxytocin and vasopressin, accumulate and enter the bloodstream?**

1. pituitary gland
2. thyroid gland
3. epiphysis
4. adrenal gland
5. parathyroid gland

**14. Which of the following hormones accumulates in the pituitary gland?**

1. melanotropin
2. lipotropin
3. vasopressin
4. adrenaline
5. prolactin

**15. Which endocrine organ produces the hormones oxytocin and vasopressin?**

1. pituitary gland
2. hypothalamus
3. epiphysis
4. adrenal gland
5. thyroid gland

**16. Which part of the adrenal gland produces the hormone aldosterone, which regulates sodium levels in the body and prevents the body from losing sodium in the urine?**

1. zona glomerulosa
2. zona fasciculata
3. zona reticularis
4. intermediate
5. medulla



**17. Which zone of the adrenal gland produces glucocorticoid hormones, which affect the metabolism of carbohydrates, proteins, and lipids?**

1. zona glomerulosa
2. zona fasciculata
3. zona reticularis
4. intermediate
5. medulla

**18. Which zone of the adrenal gland produces the androgenic hormone?**

1. zona glomerulosa
2. zona fasciculata
3. zona reticularis
4. intermediate
5. medulla

**19. Which part of the adrenal gland produces adrenaline?**

1. zona glomerulosa
2. zona fasciculata
3. zona reticularis
4. medulla
5. intermediate

**20. What is the source of development of the adenohypophysis?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

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## **CONTROL QUESTIONS ON THE NERVOUS SYSTEM, SENSE ORGANS, CARDIOVASCULAR SYSTEM, HEMATOPOIETIC ORGANS AND ENDOCRINE SYSTEM**

1. Origin and development of the nervous system, functions.
2. Peripheral nervous system (spinal cord, autonomic ganglia), development, structure, functions.
3. Central nervous system (spinal cord, cerebellum, cortex of cerebral hemispheres), structure, functions.
4. Structure of the layers of the spinal cord and brain.
5. Classification of sensory organs.
6. Primary sensory organs of the senses (organ of sight, organ of smell), development, structure, functions.
7. Secondary sense organs (organ of hearing and balance, organ of taste), development, structure, functions.
8. Classification of the circulatory system.
9. Capillaries, development, structure, types, functions.
10. Arteries, structure, types, functions.
11. Veins, structure, types, functions.
12. Heart, development, structure, function.
13. Classification of organs of hematopoiesis.
14. Central organs of hematopoiesis (red bone marrow, thymus), development, structure, function.
15. Peripheral organs of hematopoiesis (lymph nodes, spleen), development, structure, function.
16. Classification of endocrine glands.
17. Central organs of endocrine system (hypothalamus, pituitary gland), epiphysis, development, structure, functions.
18. Peripheral organs of the endocrine system (thyroid gland, parathyroid gland, adrenal gland), development, structure, functions.
19. Properties of hormones.
20. Stages of the secretory cycle.

## **TOPIC: «DIGESTION. THE ORAL CAVITY. THE STRUCTURE OF THE TONGUE AND SALIVA»**

**The purpose of the lesson:** to study the sources of development, histogenesis, structure of the tongue and salivary glands.

**The student should know:**

**Questions for preparation:**

1. General plan of the structure of the digestive system.
2. Characteristics of the structure of the oral mucosa.
3. Development of the tongue.
4. Tongue: general characteristics, tissue composition.
5. Structure and functional significance of specialized papillae of the tongue.
6. General morpho-functional characteristics of the major salivary glands.
7. Types of salivary glands, sources of development.
8. Structure of parotid gland.
9. Structure of submandibular gland.
10. Structure of the hyoid gland.

**The student should be able** to distinguish between different types of salivary glands.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Filiform papilla of tongue.
2. Foliate papilla of tongue.
3. Parotid gland.
4. Submandibular gland.

**Topics of abstract reports:**

1. The lymphoepithelial pharyngeal ring of Pirogov.
2. Regeneration of salivary glands.
3. Age-related changes of salivary glands.

### **TEST TASKS**

**1. Which tissues make up the muscles of the tongue?**

1. smooth muscle
2. skeletal muscle
3. cardiac muscle
4. myoepithelial tissue
5. myoneural tissue

## **2 Sources of tongue muscle development:**

1. dermatome
2. sclerotome
3. myotome
4. mesenchyme
5. nerve tube

**3. Which papillae are the most numerous, the smallest, without taste buds, covered with multilayered squamous partially keratinized epithelium?**

1. filiform
2. fungiform
3. circumvallate
4. foliated
5. papillae surrounded by a shaft

**4. Which papillae on the lateral surface of the tongue are most developed in children and reduced in adults?**

1. filiform
2. fungiform
3. circumvallate
4. foliated
5. papillae surrounded by a shaft

**5. What epithelium covers the lower surface of the tongue?**

1. simple squamous
2. simple prismatic
3. stratified nonkeratinized
4. stratified partially keratinized
5. transitional

**6. In structure, the parotid gland belongs to:**

1. simple alveolar
2. complex alveolar
3. simple tubular
4. complex tubular
5. simple tubule-alveolar

**7. What is the structure of the protein glands of the tongue?**

1. simple branched alveolar
2. simple tubular unbranched
3. simple tubular branched
4. complex tubular branched
5. complex alveolar branched

**8. What is the structure of the mucous glands of the tongue?**

1. simple alveolar branched
2. simple tubular unbranched
3. simple tubule-alveolar branched
4. complex tubular branched
5. complex alveolar branched

**9. Which of the following cells line the terminal secretory compartment of the parotid gland?**

1. serocytes
2. mucocytes
3. fibrocytes
4. plasmocytes
5. mixed

**10. The source of development of the oral mucosal epithelium:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**11. Which layer covers the underside of the tongue?**

1. mucosa
2. submucosa
3. muscular
4. serous
5. adventitia

**12. Which tissue forms the intrinsic lamina of the mucosa and submucosal base of the tongue?**

1. reticular tissue
2. loose fibrous irregular
3. dense fibrous irregular
4. dense fibrous regular
5. mucous

**13. What epithelium covers the fungiform papilla of the tongue?**

1. simple squamous
2. simple prismatic
3. stratified nonkeratinized
4. stratified keratinized
5. transitional

**14. Which tongue papilla is located at the level of the mucous membrane? Around the papilla there is a deep slit that separates the papilla from the roll - a thickening of the mucous membrane surrounding the papilla. In the connective tissue of the papilla and the reticule, there are often bundles of smooth muscle cells, whose contraction ensures the convergence of the papilla with the reticule.**

1. filiform
2. fungiform
3. circumvallated
4. foliated
5. mixed

**15. In which layer of the tongue are the terminal secretory portions of the salivary glands located?**

1. mucous
2. muscular
3. submucosa
4. mucous lamina propria
5. adventitia

**16. What is the secretion of the parotid gland?**

1. protein
2. mucous
3. mixed
4. serous
5. lipid

**17. Which cells are star-shaped and cover the terminal secretory sections of the major salivary glands with their processes?**

1. serocytes
2. mucocytes
3. myoepitheliocytes
4. fibrocytes
5. mixed

**18. What type of epithelium lines the striated exit ducts of the parotid salivary gland?**

1. simple squamous
2. simple cubic
3. monolayer prismatic
4. multilayered squamous
5. simple columnar

**19. What epithelium lines the intralobular exit ducts of the hyoid salivary gland?**

1. simple
2. bilayer
3. three-layered
4. stratified
5. transitional

**20. What epithelium lines the orifice of the submandibular gland?**

1. simple squamous
2. simple cubic
3. simple prismatic
4. stratified squamous
5. transitional

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## TOPIC: «TEETH»

**The purpose of the lesson:** to study the development and structure of teeth.

**The student should know:**

**Questions for preparation:**

1. General plan of tooth structure.
2. The primary and permanent teeth, tissue composition.
3. Sources of tooth development.
4. Characterization of periods of dental development.
5. Enamel, histogenesis, general characterization, structural unit, bands and enamel lines. Concept of enamel bundles, lamellae, spindles.
6. Dentin, histogenesis, structure, types.
7. Enamel, histogenesis, structure, types of function.
8. Pulp, tissue composition, layers, functions.
9. Parodontium and periodontium, structure, functions.
10. Alteration of teeth.

**The student should be able** to distinguish the tissues of the tooth.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Tooth development (early stage of enamel organ development).
2. Development of tooth.
3. Longitudinal slipping of a human tooth (uncolored preparation).

**Topics of abstract reports:**

1. Theories of tooth eruption.
2. Factors influencing tooth development.
3. Peculiarities of eruption of permanent teeth.

## TEST TASKS

**1. Name the source of dental pulp development:**

1. mesenchyme of the dental papilla
2. mesenchyme of the dental sac
3. odontoblasts
4. enameloblasts
5. fibroblasts



**2. Name the source of tooth cementum development:**

1. outer cells of the enamel organ
2. inner cells of the enamel organ
3. mesenchyme of the dental papilla
4. mesenchyme of the dental sac
5. enameloblasts

**3. Which layer of the pulp contains poorly differentiated cells?**

1. odontoblastic
2. subodontoblastic
3. Weil's layer
4. central
5. fibroblasts

**4. Retzius' physiological lines are areas of tooth enamel with:**

1. with the least calcification
2. with the greatest calcification
3. with the greatest and the least calcification
4. no change
5. with the greatest inorganic matter

**5. Identify the tooth tissue containing 3% organic matter and 97% inorganic matter. Among the inorganic substances, calcium phosphates and calcium carbonates make up the vast majority.**

1. dentin
2. enamel
3. cement
4. predentin
5. pulp

**6. Identify the tooth tissue containing 28% organic matter and 72 % inorganic matter, mainly calcium phosphate:**

1. dentin
2. enamel
3. cementum
4. pulp
5. predentin

**7. Identify the tooth tissue that has primary cell-free and secondary cellular parts:**

1. dentin
2. enamel
3. cementum
4. pulp
5. predentin

**8- Identify the tooth tissue that remains non-mineralized:**

1. mantle dentin
2. peri-pulpal dentin
3. predentin
4. cementum
5. enamel

**9. Which tooth tissue is made of prisms? Prisms are arranged in bundles, have an S-shaped twisted course, on longitudinal slides of the tooth some prisms appear to be dissected more longitudinally, and others - more transversely, which causes the alternation of light and dark bands:**

1. dentin
2. enamel
3. cementum
4. pulp
5. predentin

**10. Which connective tissue forms the pulp of a tooth?**

1. loose fibrous irregular
2. dense fibrous irregular
3. dense fibrous regular
4. reticular tissue
5. mucous tissue

**11. Name the sources of development of the enamel organ?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**12. From which of the following cells does tooth enamel develop?**

1. odontoblasts
2. ameloblasts
3. cementoblasts
4. fibroblasts

**13. Which enamel organ cells are involved in the histogenesis of dentin?**

1. odontoblasts
2. ameloblasts
3. cementoblasts
4. fibroblasts
5. subodontoblasts

**14. Which tooth tissue lacks blood vessels?**

1. bony alveolus
2. periodontium
3. cementum
4. pulp
5. loose connective tissue

**15. In which tooth tissue are Sharpeian fibres located?**

1. enamel
2. dentin
3. cementum
4. pulp
5. predentin

**16. Which type of fiber is absent in the pulp of tooth?**

1. collagenous
2. elastic
3. reticular
4. precollagenous
5. ossein

**17. In which tooth tissue are free denticles located?**

1. enamel
2. dentin
3. cementum
4. pulp
5. predentin

**18. In which tooth tissue are Schrager bands and Retzius lines located?**

1. enamel
2. dentin
3. cementum
4. pulp
5. predentin

**19. Identify the tooth tissue whose organic matrix is formed by radial and tangential collagen fibers:**

1. enamel
2. dentin
3. cementum
4. pulp
5. predentin

**20. In the peripheral layer of the pulp there are pear-shaped cells with numerous long outgrowths, the cytoplasm has a well-developed granular endoplasmic network. What kind of cells are these?**

1. enameloblasts
2. odontoblasts
3. subodontoblasts
4. fibroblasts
5. fibrocytes

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## TOPIC: «THE DIGESTIVE TRACT»

**The purpose of the lesson:** to study the development, structure and functions of the central and posterior portions of the digestive tract.

### *The student should know:*

#### **Questions for preparation:**

1. General plan of the structure of the digestive tract wall, divisions.
2. Sources of development of the digestive tube, peculiarities of development of the esophagus.
3. Structure and functions of the esophagus.
4. Structure, parts, functions of stomach.
5. Characteristics of the mucous membranes of different parts of the stomach.
6. Glands of the stomach. Main types of cells, their structure and functions.
7. Small intestine, structure, functional significance.
8. Characteristics of mucous membrane structure of different parts of small intestine.
9. Large intestine, characteristics of structure, functions.
10. Rectum, characteristics of the structure of the mucous membrane of different parts of the small intestine, functions. Intestinal compartments, functions.

*The student should be able* to differentiate the various parts of the digestive tube.

*The student should master* to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Esophagus (transverse section).
2. Bottom of stomach.
3. Duodenum.
4. Small intestine.
5. Colon.

#### **Topics of abstract reports:**

1. The Endocrine apparatus of the stomach.
2. The concept of the intestinal hormone system.
3. Appendix, structure, functions.

## TEST TASKS

**1. What kind of muscle tissue is formed the muscular layer of the esophagus in the upper third:**

1. smooth
2. skeletal
3. cardiac
4. myoneural
5. myoepithelial

**2. What type of muscle is formed the muscular layer of the oesophagus in the lower third?**

1. smooth
2. skeletal
3. cardiac
4. myoneural
5. myoepithelial

**3. What kind of epithelium forms the mucous membrane of the esophagus?**

1. simple flat
2. simple prismatic
3. transitional
4. stratified nonkeratinized
5. stratified keratinized

**4. Which glands are located in the submucosa layer of the esophagus?**

1. cardiac
2. own
3. pyloric
4. duodenal
5. endocrine

**5. Which glands are located in the lamina propria of the oesophagus?**

1. cardiac
2. own
3. pyloric
4. duodenal
5. fundal

**6. What is the structure of the esophagus's own glands?**

1. simple alveolar branched
2. simple tubular branched
3. complex alveolar branched
4. complex alveolar -tubular branched
5. complex tubular branched

**7. What is the structure of the oesophagus's cardiac glands?**

1. simple alveolar branched
2. simple tubular branched
3. complex alveolar branched
4. complex tubular branched
5. complex mixed branched

**8. Name the part of the stomach, in the mucous membrane of which there are simple tubular branched glands with a predominance of mucous cells, but with a lower content of chief cells and parietal cells:**

1. cardiac
2. fundal
3. pyloric
4. body
5. endocrine

**9. Name the section of the stomach in the mucous membrane of which there are simple tubular, branched glands, devoid of parietal cells:**

1. cardiac
2. fundal
3. pyloric
4. body
5. endocrine

**10. What is the structure of the stomach's own glands?**

1. simple tubular unbranched
2. simple tubular branched
3. simple alveolar -tubular branched
4. complex tubular branched.
5. complex alveolar branched

**11. Which cells of the stomach's glands secrete hydrochloric acid?**

1. chief
2. parietal
3. mucous
4. endocrine
5. goblet

**12. Which cells of the stomach's glands secrete gastrin?**

1. chief
2. parietal
3. mucous
4. endocrine
5. goblet

**13. Which cells of the stomach's glands secrete pepsinogen?**

1. mucous
2. chief
3. parietal
4. endocrine
5. goblet

**14. In which part of the intestine are the glands found?**

1. duodenum
2. jejunum
3. ileum
4. colon
5. large intestine

**15. Name the section of the intestine in the mucous and submucous layers of which numerous large accumulations of lymphoid tissue are located?**

1. duodenum
2. jejunum
3. ileum
4. colon
5. stomach

**16. In which part of the intestine are goblet cells predominate?**

1. duodenum
2. jejunum
3. ileum
4. colon
5. stomach

**17. Which intestinal cells are involved in parietal digestion?**

1. goblet
2. bordered
3. unbordered
4. endocrine
5. chief

**18. Which intestinal cells are involved in regeneration?**

1. goblet
2. bordered
3. unbordered
4. endocrine
5. chief



**19. What is the source of development of the mucous membrane's epithelium of the middle part of the digestive tube?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**20. By which muscle made up the sphincters in the rectum?**

1. smooth
2. skeletal
3. cardiac
4. myoepithelial
5. myoneural

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## TOPIC: «DIGESTIVE GLANDS. LIVER. PANCREAS»

**The purpose of the lesson:** to study the sources of development, histogenesis, structure and functions of the liver and pancreas.

### **The student should know:**

#### **Questions for preparation:**

1. Sources and development of the liver.
2. Functions of the liver.
3. Concepts of liver parenchyma and stroma.
4. Structure of the hepatic lobules and the hepatic girdle.
5. Characteristics of hepatocyte structure.
6. Characteristics of blood supply to the liver, triads.
7. Biliary tract, gallbladder.
8. Embryonic rudiments and development of pancreas.
9. Exocrine part of pancreas, acinar, excretory ducts, structure, functions.
10. Endocrine part of pancreas - islets of Langerhans, characteristics, structure, functions.

**The student should be able** to distinguish between the structures of the liver and of the pancreas.

**The student should master** to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Pancreas.
2. Liver of pig.
3. Human liver.

#### **Topics of abstract reports:**

1. Morphological and functional characteristics of intralobular hemocapillaries.
2. The concept of the portal tract, components of the liver triad.
3. Regeneration and age-related changes in the liver and pancreas.

## TEST TASKS

### **1. Name the source of development of the liver and pancreas:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**2. The intra-lobular blood circulation system of the liver is represented by capillaries:**

1. with continuous basal membrane
2. partially discontinuous basal membrane
3. with discontinuous basal membrane
4. fenestrated type
5. lymphatic vessels

**3. Liver macrophages are represented by:**

1. hepatocytes
2. Kupffer cells
3. lipocytes
4. endothelium
5. fibrocytes

**4. In damage of which liver function secondary sexual characteristics are considerably expressed?**

1. protein-forming
2. bile-forming
3. detoxification
4. urea-forming
5. glycogen- forming

**5. Which liver function disorder affects blood clotting?**

1. protein-forming
2. bile-forming
3. detoxification
4. urea-forming
5. glycogen-forming

**6. The structural and functional unit of the pancreas is represented by:**

1. acinus
2. lobule
3. triad
4. trabecula
5. part

**7. Name the pancreatic cell that has large granules in the apical part and a granular endoplasmic network in the basal part?**

1. hepatocyte
2. acinus cell
3. centroacinar cell
4. endocrine cell
5. goblet cell

**8. Which cells in the endocrine islet of Langerhans produce insulin?**

1. A-cells
2. B-cells
3. D-cells
4. PP-cells
5. D-1- cells

**9. Which hormone is produced by the D-cells of the endocrine islet of Langerhans?**

1. insulin
2. glucagon
3. somatostatin
4. pancreatic polypeptide
5. Vip

**10. Which cells in the endocrine islet of Langerhans produce glucagon?**

1. A-cells
2. B-cells
3. D-cells
4. PP- cells
5. D-1-cells

**11. Which epithelium lines the wall of the inter- and intralobular ducts of the pancreas?**

1. simple squamous
2. simple cubic
3. simple prismatic (columnar)
4. stratified squamous
5. pseudostratified

**12. What epithelium lines the wall of the interlobular and common ducts of the pancreas?**

1. simple squamous
2. simple cubic
3. simple prismatic (columnar)
4. stratified squamous
5. pseudostratified

**13. What epithelium lines the wall of the intercalated duct of the pancreas?**

1. simple squamous
2. simple cubic
3. simple prismatic (columnar)
4. stratified squamous
5. pseudostratified

**14. The epithelium of which pancreatic ducts has centroacinar cells?**

1. in the intercalated
2. in the interacinar
3. in the intralobular
4. in the interlobular
5. In the common

**15. What is the structure of the pancreas?**

1. simple alveolar branched
2. simple tubular branched
3. compound tubular branched
4. compound alveolar-tubular branched
5. simple tubular unbranched

**16. Under the influence of which hormone, there is an increased breakdown of glycogen to glucose in tissues, and therefore the amount of glucose in the blood may increase, producing a hyperglycemic effect?**

1. insulin
2. glucagon
3. somatostatin
4. pancreatic polypeptide
5. Vip

**17. Which pancreatic hormone promotes the uptake of blood glucose by tissue cells, thereby exerting a hypoglycemic effect, i.e., reducing the amount of glucose in the blood?**

1. insulin
2. glucagon
3. somatostatin
4. pancreatic polypeptide
5. Vip

**18. Which pancreatic hormone inhibits the release of hormones by A- and B-cells and also suppresses enzyme synthesis by acinus cells?**

1. insulin
2. glucagon
3. somatostatin
4. pancreatic polypeptide
5. Vip

**19. What percentage of the total islet cell mass in the Langergans are A-cells?**

1. 2–5 %
2. 5–10 %
3. 20–25 %
4. 70–75 %
5. 1–2%

**20. What percentage of the total islet cell mass in the Langergans are D-cells?**

1. 2–5 %
2. 5–10 %
3. 20–25 %
4. 70–75 %
5. 1–2 %

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## **CONTROL QUESTIONS OF THE DIGESTIVE SYSTEM**

1. General plan of the structure of the digestive system.
2. General characteristics, development, structure and functions of the tongue.
3. The structure and functional significance of the specialized papillae of the of the tongue.
4. General morpho-functional characterization of the major salivary glands.
5. Types of salivary glands, sources of development, structure, types of secretion, functions.
6. General plan of tooth structure, tissue composition.
7. Sources of development of the tooth, characteristics of periods of its development.
8. Hard tissues of the tooth: enamel, dentin, cementum, structure, types.
9. Soft tissues of the tooth - pulp, tissue composition, layers, functions.
10. Parodontium and periodontium, structure, functions.
11. General plan of structure of digestive tube, sources of development.
12. Characteristics of development, structure, functions of esophagus.
13. Characteristics of the structure of the various departments of the stomach.
14. Glands of the stomach, structure, major cell types, functions.
15. Structure and function of the small intestine.
16. Structure of epithelium of villi and crypts, functions.
17. Structure and functions of the large intestine.
18. Characteristics of the structure of the various parts of the rectum, functions.
19. Embryonic rudiments and course of development of liver and pancreas.
20. The concept of parenchyma and stroma of the liver, functions.
21. Structure of hepatic lobule, hepatic bar, hepatocyte, triad.
22. Biliary tract, gallbladder.
23. Characteristics of blood supply to the liver.
24. Pancreas, tissue composition.
25. Endocrine part of pancreas.
26. Structure of the structural and functional unit - pancreas, types, functions.
27. Duct of pancreas, structure.
28. Endocrine part of pancreas.
29. Characteristics of islets of Langerhans, their functions.
30. Regeneration and age-related changes.

## TOPIC: «RESPIRATORY SYSTEM»

**The purpose of the lesson:** to study the development, structure and functions of the organs of the respiratory system.

**The student should know:**

**Questions for preparation:**

1. Development of the respiratory system.
2. General morpho-functional characterization of the respiratory system.
3. Airways, composition, function.
4. Trachea, structure, function.
5. Epithelial lining of bronchi.
6. Large-caliber bronchi, structure, function.
7. Medium caliber bronchi, structure, function.
8. Small caliber bronchi, structure, function.
9. Airway, structure of acinus, alveoli, function.
10. Airway barrier, structure, function.

**The student should be able** to differentiate between bronchi of different calibers, sections of the acinus.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Trachea (transverse section).
2. Human lung.

**Topics of abstract reports:**

1. Surfactant alveolar complex.
2. Age-related changes in the lung.
3. Regeneration of respiratory organs.

## TEST TASKS

**1. From which germ layer does the cartilage tissue of bronchi develop?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube



**2. From which germ layer does the muscular plate of the mucous membrane develop in small caliber bronchi?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**3. The inner surface of the trachea is lined with epithelium:**

1. single-layer single-row
2. single-layer multi-row (pseudostratified)
3. stratified transitional
4. stratified squamous
5. simple columnar

**4. The epithelium of the airways has an organoid of special significance:**

1. cilia
2. flagellum
3. microvilli
4. myofibrils
5. tonofibrils

**5. The respiratory epithelium contains unicellular endoepithelial glands that secrete a mucous secretion onto the surface of the epithelial layer that moistens the epithelium and creates conditions for the adhesion of dust particles. Name these glands:**

1. ciliated cells
2. basal cells
3. goblet cells
4. endocrine cells
5. Clara cells

**6. This organ's layer is represented by a loose fibrous irregular connective tissue, containing a large number of mixed protein - mucous (seromucous) glands. Which organ and which layer?**

1. the lamina propria of the mucosa in larynx
2. submucosa of the trachea
3. adventitia of the main bronchus
4. serosa of the lung
5. cartilage

**7. The fibrous-cartilaginous layer of which organ is represented by hyaline unclosed rings, the free ends of which are connected by bundles of smooth muscle cells attached to the outer surface of the cartilage?**

1. trachea
2. primary bronchus
3. secondary bronchus
4. tertiary bronchus
5. lung

**8. From which germ layer does the epithelium of the nasal vestibule develop?**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**9. Which cells of the respiratory epithelium are called cambial cells?**

1. ciliated
2. basal
3. goblet
4. endocrine
5. Clara

**10. The pleura of the lung develops from:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**11. Which cells provide the warming of air at the level of the alveoli?**

1. type I alveolocytes
2. type II alveolocytes
3. type III alveolocytes
4. alveolar macrophages
5. goblet

**12. Name the bronchial layer containing the unicellular endoepithelial glands:**

1. mucosa
2. submucosa
3. cartilaginous
4. adventitial
5. serosa

**13. The adventitia of the trachea is represented by:**

1. loose fibrous irregular connective tissue
2. dense fibrous irregular connective tissue
3. dense fibrous regular connective tissue
4. reticular tissue
5. cartilage

**14. What is the structure and secretion of glands located in the submucosa of the trachea?**

1. simple protein
2. simple mucous
3. compound mucous
4. compound protein-mucous
5. simple mixed

**15. Name the alveolar cells capable of synthesizing surfactant, containing acidic and alkaline phosphatase:**

1. type I alveolocyte
2. type II alveolocyte
3. type III alveolocyte
4. macrophage
5. Clara

**16. The slide shows a bronchus consisting of a mucosa lined with cubic pseudostratified epithelium, submucosa with an insignificant number of mixed mucous-protein glands, fibrous cartilaginous layer represented by elastic cartilaginous tissue and adventitia of loose fibrous unformed connective tissue. Name this bronchus:**

1. primary bronchus
2. secondary bronchus
3. tertiary bronchus
4. terminal bronchioles
5. respiratory bronchioles

**17. The slide shows a bronchus consisting of mucosa and thickened adventitia. There is no cartilage or glands. The muscular lamina of the mucosa becomes more powerful in relation to the thickness of the whole wall, so it is always gathered in numerous folds. Name this bronchus:**

1. primary bronchus
2. secondary bronchus
3. tertiary bronchus
4. terminal bronchioles
5. respiratory bronchioles

**18. Name the respiratory epithelial cells that are dome-shaped and contain a well-developed smooth ER. These cells produce enzymes that break down the surfactant covering the respiratory compartments:**

1. ciliated cell
2. endocrine cell
3. basal cell
4. Clara cell
5. goblet cell

**19. Cells of thickened elongated shape, on the free surface of cytoplasm there are very short cytoplasmic outgrowths facing into the alveolar cavity, which significantly increases the total area of air contact with the surface of the epithelium, is an important component of the aerogematic barrier. Name these cells:**

1. type I alveolocytes
2. type II alveolocytes
3. macrophages
4. endocrine cells
5. goblet cells

**20. Which cells regulate the contraction of respiratory myocytes? These cells are pyramidal in shape and have secretory granules at the basal part that contain norepinephrine, serotonin, and dopamine:**

1. secretory cell
2. basal cell
3. endocrine cell
4. Clara cell
5. goblet cell

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## TOPIC: «SKIN AND ITS DERIVATIVES»

**The purpose of the lesson:** to study the sources of development, structure, types, functions of skin and its derivatives.

### *The student should know:*

#### **Questions for preparation:**

1. Sources of embryonic development of skin, its derivatives.
2. Functions of the skin.
3. The structure of different types of skin.
4. Epidermis, peculiarities of its structure in thin and thick skin.
5. Dermis, layers, tissue composition, functions.
6. Subcutaneous tissue (hypodermis), structure, functions.
7. Hair, development, types, structure, change.
8. Glands of the skin: sweat, sebaceous glands, structure, type of secretion, functions.
9. Nails, structure, structure, functions.
10. Physiological regeneration of the skin.

*The student should be able* to distinguish between different types of skin and its derivatives.

**The student should master** to microscope and analysis histological slides.

Demonstration slides:

1. Skin of a human finger.
2. Skin of the hairy part of the human head.

Topics of abstract reports:

1. Age-related changes in skin and its derivatives.
2. The process of keratinization and its stages.
3. Growth and change of hair, pigmentation.

## TEST TASKS

### **1. Name the source of development of the skin's epidermis:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**2. Name the source of development of the skin's dermis:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**3. Name the source of development of the skin's hypodermis:**

1. ectoderm
2. endoderm
3. mesoderm
4. mesenchyme
5. nerve tube

**4. To which type of epithelium does the skin's epidermis belong?**

1. simple columnar
2. transitional
3. stratified non-keratinized
4. stratified keratinized
5. simple cubic

**5. The presence of which special organelle is characteristic of the epithelial cells in the skin's epidermis?**

1. myofibrils
2. neurofibrils
3. tonofibrils
4. cilia
5. flagellum

**6. In which layer of the epidermis are Merkel cells and Langerhans cells found?**

1. basal
2. spinous
3. granular
4. stratum corneum
5. lucidum

**7. Through which layers in the skin's epidermis does physiological regeneration occur?**

1. basal
2. granular
3. lucidum
4. stratum corneum
5. horny

**8. In which layer of the epidermis are melanocytes located?**

1. basal
2. spinous
3. granular
4. stratum corneum
5. lucidum

**9. Which cells of the skin's epidermis contain the protein keratohyalin?**

1. basal
2. spinous
3. granular
4. stratum corneum
5. lucidum

**10. In which layer of the epidermis are the cells that contain the protein eleidin?**

1. basal
2. spinous
3. granular
4. lucidum
5. horny

**11. In which layer of the epidermis is the protein keratin found?**

1. basal
2. granular
3. lucidum
4. stratum corneum
5. spinous

**12. What type of connective tissue makes up the papillary layer of the skin's dermis?**

1. loose fibrous irregular
2. reticular connective
3. dense fibrous irregular
4. dense fibrous regular
5. adipose

**13. What type of connective tissue makes up the reticular layer of the skin's dermis?**

1. loose fibrous irregular
2. reticular connective
3. dense fibrous irregular
4. dense fibrous regular
5. adipose

**14. In which layer of the skin are Meissner's tactile corpuscles located?**

1. basal zone of the epidermis
2. papillary layer of the dermis
3. reticular layer of the dermis
4. hypodermis
5. granular zone of the epidermis

**15. What type of connective tissue makes up the hypodermis of the skin?**

1. loose fibrous irregular
2. dense fibrous irregular
3. dense fibrous regular
4. adipose tissue
5. reticular

**16. How many layers are there in the epidermis of thick skin?**

1. two
2. three
3. four
4. five
5. one

**17. How many layers are there in the epidermis of thin skin?**

1. two
2. three
3. four
4. five
5. one

**18. In which part of the hair do the cells lie in the form of coin stacks?**

1. basal zone
2. cortical substance
3. medullary substance
4. cuticle
5. hair shaft

**19. What type of structure do sweat glands have?**

1. simple tubular unbranched
2. simple alveolar branched
3. simple tubular branched
4. complex tubular branched
5. complex alveolar branched

**20. What type of structure do sebaceous glands have?**

1. simple tubular unbranched
2. simple tubular branched
3. simple alveolar branched
4. complex alveolar branched
5. complex alveolar branched



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## TOPIC: «URINARY SYSTEM»

**The purpose of the lesson:** to study the sources of development, structure and functions of the organs of the urinary system.

**The student should know:**

**Questions for preparation:**

1. Sources of development of the kidneys.
2. Development of the prekidney, primary and terminal kidneys, their functional significance.
3. General morpho-functional features of the urinary system.
4. Types of nephrons, their morpho-functional characteristics.
5. Characteristics of the structure of different parts of the nephron, filtration barrier.
6. Characteristics of blood supply to the kidney.
7. Stages of urine formation. Histophysiology of the nephron.
8. Endocrine apparatus of the kidney (juxtaglomerular and prostaglandin), its structure and functional significance.
9. Structure of urinary tract (ureter, bladder).
10. Age-related changes in the kidneys.

**The student should be able** to give a histophysiological assessment of the state of the organs of the urinary system.

**The student should master** to microscope and analysis histological slides.

**Demonstration slides:**

1. Kidney.
2. Ureter.
3. Bladder.

**Topics of abstract reports:**

1. The endocrine system of the kidney.
2. Ultrastructural analysis of the filtration barrier.
3. Recent ideas on the histophysiology of the nephron.

## TEST TASKS

**1. The vascular glomerulus of the renal corpuscle of the nephron is represented by:**

1. a capillary with a continuous basal membrane
2. a capillary with a fenestrated basal membrane
3. a capillary with a discontinuous basal membrane
4. an arteriola
5. a venule

**2. Which nephron cells have broad, large processes called cytotrapezium, from which small processes called cytopodia branch off, and are an important component of the filtration barrier?**

1. endothelial cells
2. podocytes
3. mesangial cells
4. pericytes
5. juxtaglomerular cells

**3. Name the part of the kidney where the epithelium consists of light and dark cells. The dark cells secrete hydrochloric acid. The light cells are poor in organelles, and their cytolemma forms folds:**

1. renal corpuscle
2. convoluted tubules
3. nephron loop
4. collecting tubules
5. macula densa

**4. Cells from which part of the nephron have a brush border and basal striations?**

1. glomerular capsule
2. proximal tubule
3. distal tubule
4. collecting tubules
5. nephron loop

**5. Which part of the nephron forms the macula densa, lying between the arterioles?**

1. glomerular capsule
2. proximal tubule
3. distal tubule
4. nephron loop
5. collecting tubules

**6. Identify the structure of the renal corpuscle if it has a three-layered structure. The outer and inner layers are light, and the middle layer forms a network with a cell diameter of 7 nm:**

1. inner layer of the capsule
2. outer layer of the capsule
3. basal membrane
4. wall of the capillary
5. nephron loop

**7. In kidney disease-nephritis-formative blood elements and plasma proteins with large molecules are found in the patient's urine. Indicate which part of the nephron is affected:**

1. nephron capsule
2. proximal tubule
3. distal tubule
4. nephron loop
5. collecting tubules

**8. Cells that absorb proteins from primary urine through pinocytosis, which are then broken down into amino acids by lysosomal enzymes, are found in which part of the nephron?**

1. nephron capsule
2. proximal tubule
3. distal tubule
4. nephron loop
5. collecting tubules

**9. Which cells of the prostaglandin apparatus are the source of prostaglandins that have an antihypertensive effect?**

1. dark cells of the collecting tubules
2. light cells of the collecting tubules
3. mesangial cells
4. juxtaglomerular cells
5. podocytes

**10. What type of epithelium lines the mucosa of the bladder?**

1. simple columnar
2. stratified transitional
3. simple cubic
4. glandular
5. squamous

**11. Name the structure of nephron tubular cells that is significant for protein reabsorption and complete glucose reabsorption:**

1. brush border
2. basal striations
3. cytolemmal folds
4. mitochondria
5. lysosomes

**12. Identify the structures of nephron tubular cells that are significant for passive water reabsorption:**

1. brush border
2. cytolemmal folds
3. mitochondria
4. lysosomes
5. basal striations

**13. Which organelle in nephron tubular cells plays an important role in sodium reabsorption?**

1. ribosomes
2. lysosomes
3. mitochondria
4. microtubules
5. cytolemma

**14. In a patient's urine analysis, large amounts of proteins and sugar are found. Which part of the nephron has undergone qualitative changes?**

1. glomerular capsule
2. nephron loop
3. proximal tubule
4. distal tubule
5. collecting tubule

**15. Name the cells located in the walls of the afferent and efferent arterioles beneath the endothelium, which have renin granules in their cytoplasm:**

1. mesangial cells
2. juxtaglomerular cells
3. juxtavascular cells
4. interstitial cells
5. podocytes

**16. Which cells belong to the prostaglandin apparatus of the kidneys, being of mesenchymal origin, elongated, and branched, connecting them with the nephron tubules and blood capillaries?**

1. mesangial cells
2. juxtaglomerular cells
3. juxtavascular cells
4. interstitial cells
5. podocytes

**17. Identify the organ of the urinary tract if its mucosa forms deep longitudinal folds, and alveolar tubular glands are located in the submucosa. The muscular layer is double-layered in the upper part and triple-layered in the lower part:**

1. renal calyces
2. renal pelvis
3. ureters
4. urinary bladder
5. kidney

**18. In which structure of the kidney's endocrine system are cells devoid of basal striations and basal membranes, functioning as "sodium receptors"?**

1. macula densa
2. juxtaglomerular cells
3. juxtavascular cells
4. interstitial cells
5. podocytes

**19. In which part of the nephron does the filtration of fluid from blood plasma occur?**

1. renal corpuscle
2. proximal tubule
3. Henle's loop
4. distal tubule
5. collecting tubule

**20. Where does the third phase of urine formation – acidification of urine – occur?**

1. in the renal corpuscle
2. in the renal calyces
3. in Henle's loop
4. in the collecting tubules
5. proximal tubule

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## TOPIC: «MALE REPRODUCTIVE SYSTEM»

**The purpose of the lesson:** to study the sources of development, structure and functions of the organs of the male sexual system.

### **The student should know:**

#### **Questions for preparation:**

1. The general morpho-functional characteristics of the organs of the male sexual system.
2. Embryonic development of male genital organs, stages.
3. Testis, structure, functions.
4. Twisted tubules of testis, structure.
5. Hemotesticular barrier, structure.
6. Seminal ducts, structure.
7. Testicular appendage, structure, functions.
8. Seminal vesicles, structure, functions.
9. Prostate gland, structure, functions.
10. Age-related characteristics.

**The student should be able** to identify the different parts of the male reproductive system.

**The student should master** to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Testis.
2. Testicular appendage.
3. Prostate gland (during puberty).

#### **Topics of abstract reports:**

1. Influence of exogenous and endogenous factors on the development of male genital organs of male sexual system.
2. Age-related changes in the testes.
3. Regulation of male sexual system functions.

## TEST TASKS

**1. The cells are pyramidal shape, the cytoplasm contains lipid and carbohydrate inclusions in the cytoplasm, well-developed smooth endoplasmic reticulum, located on the basal membrane facing the lumen of the convoluted seminal tubule. Name these cells:**

1. spermatocytes
2. sustentocytes
3. glandulocytes
4. fibrocytes
5. spermatogonia

**2. Large rounded shape cells, the cytoplasm contain glycoprotein inclusions, well-developed smooth endoplasmic reticulum, located around blood capillaries between loops of twisted seminal tubules. Name these cells:**

1. spermatocytes
2. sustentocytes
3. glandulocytes
4. fibrocytes
5. spermatogonia

**3. Which layer covers the testes?**

1. mucous
2. serous
3. epithelial
4. reticular
5. connective

**4. By what tissue is represented the stroma of the testis?**

1. LFICT
2. reticular
3. DFICT
4. epithelial
5. serous

**5. Which cells of the testis undergo complex rearrangement transformation?**

1. spermatocytes
2. sustentocytes
3. glandulocytes
4. fibrocytes
5. Sertoli cells



**6. Which cells produce the hormone -testosterone?**

1. spermatocytes
2. sustentocytes
3. glandulocytes
4. fibrocytes
5. Sertoli cells

**7. What epithelium lines the mucosa of the straight seminiferous tubules in the testis?**

1. simple squamous
2. simple cuboidal
3. simple columnar
4. ciliated
5. stratified

**8. The epithelium of the seminiferous tubules has a specialized organoid, of special importance:**

1. microvilli
2. cilia
3. myofibrils
4. flagellum
5. tonofibrils

**9. What is the epithelium that lines the layer of the ductus deferens of the testis?**

1. single-row
2. two-row
3. three-row
4. stratified
5. transitional

**10. In which of the seminal ducts is the muscular layer, consisting of three layers- inner longitudinal, middle circular, and outer longitudinal – significantly developed and the mucous layer forms longitudinal folds?**

1. straight tubules
2. seminiferous tubules
3. ductus deferens
4. ejaculatory duct
5. ductus epididymis

**11. In which of the seminal tracts does the ductal epithelium become double-rowed and have distinct and insertional cells, as well as a glycocalyx covering the spermatozoa?**

1. straight tubules
2. rete testis
3. ductus deferens
4. epididymis
5. seminiferous tubules

**12. In which of the seminal tracts is the epithelium dominated by cuboidal and squamous cells, with a circula myocytes of muscular layer?**

1. straight tubules
2. rete testis
3. ductus deferens
4. epididymis
5. seminiferous tubules

**13. In which of the seminal tracts do groups of ciliated cells and apocrine-secreting glandular cells alternate in the epithelium?**

1. straight tubules
2. rete testis
3. ductus deferens
4. epididymis
5. seminiferous tubules

**14. In which tubules does spermatogenesis take place?**

1. seminiferous tubules
2. straight tubules
3. rete testis
4. epididymis
5. ductus deferens

**15. Specify the duration of spermatogenesis?**

1. 24 hours
2. 2 days
3. 75 days
4. 120 days
5. 180 days

**16. Which part of the seminal tract is used to store sperm?**

1. seminiferous tubules
2. straight tubules
3. rete testis
4. epididymis
5. ductus deferens

**17. In which of the seminal tracts does the muscle layer consist of two layers, an inner longitudinal layer and an outer circular layer of smooth muscle cells?**

1. straight tubules
2. seminiferous tubules
3. ductus deferens
4. ejaculatory duct
5. epididymis

**18. What is the structure of the prostate gland?**

1. simple branched alveolar
2. simple branched alveolar-tubular
3. compound branched alveolar-tubular
4. compound branched tubular
5. simple branched tubular

**19. What is the epithelium that lines the terminal secretory compartments of the prostate gland?**

1. single-row
2. double-row
3. multi-row
4. stratified
5. keratinized

**20. What kind of tissue formed the prostate gland?**

1. epithelial
2. reticular
3. muscular
4. dense connective tissue
5. serous

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## TOPIC: «FEMALE REPRODUCTIVE SYSTEM»

**The purpose of the lesson:** to study the sources of development, structure and functions of the organs of the female genital system.

### *The student should know:*

#### **Questions for preparation:**

1. The general morphofunctional characteristics of the organs of the female system.
2. Embryonic development of the female genital organs.
3. Structure and functions of the ovaries.
4. Distinction between ovogenesis and spermatogenesis.
5. Structure of primordial and developing follicles.
6. Structure and functions of the atretic body.
7. Ovulation and developmental stages of the corpus luteum.
8. Fallopian tubes, uterus, vagina, structure, functions.
9. Structure, functions of the mammary gland.
10. The menstrual-ovarian cycle and its hormonal regulation.

*The student should be able* to differentiate the organs of the female reproductive system.

*The student should master* to microscope and analysis histological slides.

#### **Demonstration slides:**

1. Ovary.
2. Part of corpus luteum.
3. Uterus.
4. The lactating mammary gland of the female.

#### **Topics of abstract reports:**

1. Influence of exogenous and endogenous factors on the development of female genital system.
2. Cyclic changes of the uterus.
3. Age-related changes in female genital organs.

## TEST TASKS

### **1. Which of the following structures forms at the site of the corpus luteum?**

1. atretic body
2. white body
3. growing follicle
4. vesicular follicle
5. primordial follicle

**2. Which structure of the ovary is represented in a section consisting of loose fibrous irregular connective tissue, in which blood vessels are located?**

1. cortical substance
2. medullary substance
3. corpus luteum
4. atretic body
5. growing follicle

**3. Increased levels of estrogens have been detected in a woman's blood. Which ovarian structures are responsible for the increased hormone levels?**

1. white body
2. corpus luteum
3. atretic body
4. growing follicle
5. medullary substance

**4. What type of secretion occurs in the mammary glands?**

1. merocrine
2. apocrine
3. holocrine
4. endocrine
5. exocrine

**5. Residuals of the functional layer of the endometrium (remnants of uterine glands) are found in the uterus. Which phase of the menstrual cycle is being discussed?**

1. desquamation
2. proliferation
3. secretion
4. regeneration
5. premenstrual

**6. In a section of the ovary, numerous primordial follicles are observed, consisting of oogonia surrounded by a single layer of flat follicular cells. Among them, growing follicles at various stages of development are also present, as well as atretic white and yellow bodies. Which part of the ovary is represented?**

1. cortical substance
2. medullary substance
3. capsule
4. vascular-nervous bundle
5. stroma

**7. In the cortical substance of the ovary, structures resembling yellow bodies are visible, with a wrinkled, shiny surface in the center. Name these structures:**

1. growing follicle
2. atretic body
3. corpus luteum
4. white body
5. primordial follicle

**8. In the event of weakened labor activity in the uterus due to the weak contractile ability of the myometrium, which hormonal intervention could help?**

1. estrogens
2. androgens
3. oxytocin
4. progesterone
5. testosterone

**9. In a histological analysis of an endometrial biopsy from a healthy woman, large, compactly arranged polygonal cells rich in lipids and glycogen are found in the stroma. What are these cells?**

1. follicular cells
2. interstitial cells
3. lutein cells
4. decidual cells
5. fibrocyte

**10. What size do smooth muscle cells of the myometrium reach during pregnancy?**

1. 50  $\mu\text{m}$
2. 100  $\mu\text{m}$
3. 500  $\mu\text{m}$
4. 1000  $\mu\text{m}$
5. 5 mm

**11. In a histological preparation made from the wall of a healthy woman's uterus, the endometrium is covered with high-columnar epithelium with cilia, and the uterine glands are convoluted, with many decidual cells present. What stage of the ovarian-menstrual cycle does this preparation demonstrate?**

1. desquamation
2. proliferation
3. secretion
4. regeneration
5. menstrual

**12. A histological preparation from female organs shows a mucous membrane lined with two types of cells: ciliated and glandular cells that secrete mucus. Identify which organ is represented in the preparation:**

1. fallopian tubes
2. uterus
3. vagina
4. mammary gland
5. ovary

**13. Which hormones from the pituitary gland act on the myometrium of the uterus during the desquamation phase?**

1. somatotrophic
2. follicle-stimulating
3. luteinizing
4. oxytocin and vasopressin
5. thyroid-stimulating

**14. Which hormones from the pituitary gland predominantly act on the myometrium during the proliferation phase?**

1. somatotrophic
2. follicle-stimulating
3. luteinizing
4. oxytocin and vasopressin
5. thyroid-stimulating

**15. Which hormones from the pituitary gland predominantly act on the myometrium during the secretion phase?**

1. somatotrophic
2. follicle-stimulating
3. luteinizing
4. oxytocin and vasopressin
5. thyroid-stimulating

**16. In a histological preparation made from the wall of a healthy woman, the endometrium is covered with cylindrical epithelium without cilia, the uterine glands are straight, and decidual cells are absent. Name the stage of the sexual cycle?**

1. desquamation
2. proliferation
3. secretion
4. regeneration
5. menstrual

**17. What type of epithelium lines the mucous membrane of the vagina?**

1. simple squamous
2. simple cuboidal
3. stratified transitional
4. stratified squamous
5. simple columnar

**18. The corpus luteum synthesizes the hormone:**

1. estrogens
2. androgens
3. progesterone
4. gonadocrinine
5. testosterone

**19. Which ovarian hormones inhibit the growth and maturation of oocytes, causing oocyte death and preventing the formation of excess oocytes (superovulation)?**

1. estrogen
2. androgen
3. progesterone
4. gonadocrinine
5. testosterone

**20. What are the cells of the corpus luteum that produce the hormone progesterone called?**

1. decidual cells
2. lutein cells
3. interstitial cells
4. follicular cells
5. fibrocyte

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## **CONTROL QUESTIONS ON RESPIRATORY SYSTEM, SKIN, URINARY SYSTEM, MALE AND FEMALE GENITAL SYSTEM**

1. General morpho-functional characterization of the organs of the respiratory system.
2. Sources and development of respiratory organs.
3. Airways of the respiratory system.
4. Structure of the trachea.
5. Structure of the large bronchus.
6. Structure of the middle bronchus.
7. Structure of the small bronchus.
8. The acinus of the respiratory system.
9. Structure of the alveolar wall.
10. Structure of the air-blood barrier.
11. Sources of skin development.
12. Tissue composition of the skin, functions of the skin.
13. Types of skin - thick skin, thin skin.
14. Epidermis, structure, characteristics.
15. Dermis of the skin, layers, structure, functions.
16. Sweat glands, types of secretion, structure, function.
17. Sebaceous glands, structure, type of secretion, function.
18. Hair, types, structure.
19. Nail, its parts, structure.
20. Aging of skin and its derivatives.
21. General morpho-functional features of organs urinary system.
22. Sources and developmental stages of the kidney.
23. Morpho-functional classification of nephrons.
24. Histophysiology of the nephron.
25. Filtration barrier, structure, function.
26. Blood supply of the kidney.
27. Justaglomerular apparatus of the kidney.
28. Prostaglandin system of the kidney.
29. Structure of the ureters.
30. Structure of the bladder.
31. General morpho-functional characterization of the organs of the male genital system.
32. Embryonic development of the male genital organs.
33. Testis, general plan of structure, functions.
34. Twisted tubules of testis, structure, functions.
35. Hematotesticular barrier, structure, functions.
36. Spermatogenesis, its stages.

37. Seminal tracts - direct tubules, testicular network, seminiferous tubules, appendage canal network, vas deferens, seminal duct, structure, functions.
38. Seminal vesicles, structure, functions.
39. Prostate gland, structure, functions.
40. Age-related changes in male reproductive organs.
41. General morpho-functional characterization of female genital organs.
42. Embryonic development of female genital organs.
43. Ovary, structure, functions.
44. Ovogenesis.
45. Structure of follicles of the cortical substance of the ovary.
46. Atretic body, structure, functions.
47. Ovulation, factors influencing it.
48. Developmental stages of the corpus luteum.
49. Brain substance of the ovary, structure.
50. Age related changes in the ovary.
51. Fallopian tubes, structure, functions.
52. Uterus, wall structure, functions.
53. Changes in endometrium and myometrium during pregnancy.
54. Vagina, structure, functions.
55. Cyclic changes in ovaries, uterus, vagina.
56. Menstrual phase.
57. Postmenstrual phase.
58. Premenstrual phase.
59. Mammary glands (lactating, non-lactating), structure, function.
60. Age-Related Changes in the Organs of the Female Genital System.

## TOPIC: «HUMAN EMBRYOGENESIS»

**The purpose of the lesson:** to examine the general plan of human embryonic development and to form an understanding of the biological processes involved in embryo development.

### **Students should know:**

#### **Questions for preparation:**

1. Characteristics of gametes and their significance in development.
2. Structure of the sperm cell.
3. Female gamete: structure and features.
4. Embryonic period: definition and characteristics.
5. Biological essence of fertilization.
6. Cleavage and its biological characteristics. Types of cleavage. Connection between cleavage and the type of ovum.
7. Blastula of mammals.
8. Gastrulation: characteristics of all types of gastrulation.
9. Types of placentae.
10. Development, structure, and functions of the placenta.

### **The students should be able to:**

- identify gametes and their structural details,
- recognize developing embryonic organs and identify their tissue elements under a microscope,
- determine the stages of embryonic development,
- identify structural details of the placenta at different stages of its development.

**The students should master:** to microscopy and analysis of histological slides of embryos at various stages of development.

### **Demonstration slides:**

1. Human placenta.

### **Topics of abstract reports:**

1. Critical periods of fetal development.
2. Developmental abnormalities of the fetus.
3. The role of ontogenesis disorders in human pathology.

## TEST TASKS

### **1. Which organelle is absent in the egg cell?**

1. endoplasmic reticulum
2. centrosome
3. lysosomes
4. ribosomes
5. mitochondria

### **2. Which general-purpose organelle is modified in the sperm cell, and its damage makes fertilization impossible?**

1. endoplasmic reticulum
2. mitochondria
3. Golgi complex
4. lysosomes
5. ribosomes

### **3. What inclusions are present in the egg cell?**

1. trophic
2. secretory
3. excretory
4. pigment
5. mixed

### **4. Which components of the egg cell cytoplasm ensure the formation of different types of egg cells?**

1. general-purpose membrane-bound organelles
2. specialized organelles
3. inclusions
4. general-purpose non-membrane-bound organelles
5. cytolemma

### **5. To which components of the egg cell cytoplasm do yolk granules belong?**

1. lysosomes
2. peroxisomes
3. ribosomes
4. inclusions
5. microtubules

### **6. Which specialized organelle does the sperm cell have?**

1. microvilli
2. myofibrils
3. flagellum
4. neurofibrils
5. cilium

**7. Determine the structural formula of the sperm flagellum:**

1.  $(9 \times 3) + 0$
2.  $(9 \times 2) + 2$
3.  $(8 \times 3) + 1$
4.  $(8 \times 3) + 0$
5.  $(8 \times 2) + 0$

**8. To which general-purpose organelle does the sperm acrosome belong?**

1. peroxisome
2. lysosome
3. ribosome
4. Golgi complex
5. mitochondrion

**9. Determine the chromosome set in a sperm cell:**

1. diploid
2. haploid
3. tetraploid
4. triploid
5. polyploid

**10. Determine how long the human egg cell utilizes its nutrient reserves after ovulation before dying if fertilization does not occur:**

1. 12–24 minutes
2. 12–24 hours
3. 12–24 days
4. 24–28 days
5. 120 days

**11. Determine the type of egg cell in amphibians (frogs):**

1. primary isolecithal
2. secondary isolecithal
3. moderately telolecithal
4. strongly telolecithal
5. centrolecithal

**12. What type of egg cell do birds have?**

1. primary isolecithal
2. secondary isolecithal
3. moderately telolecithal
4. strongly telolecithal
5. centrolecithal

**13. What type of egg cell does a human have?**

1. primary isolecithal
2. secondary isolecithal
3. moderately telolecithal
4. ctrongly telolecithal
5. centrolecithal

**14. Determine the speed of human sperm movement:**

1. 1–5 mm per minute
2. 1–5 cm per minute
3. 1–5 meters per minute
4. 1–5 mm per second
5. 1–5 mm per hour

**15. How long do human sperm retain their fertilizing ability?**

1. 24–36 seconds
2. 24–36 minutes
3. 24–36 hours
4. 4–6 days
5. 60 days

**16. How long does the process of spermatogenesis last in humans?**

1. 75 seconds
2. 75 minutes
3. 75 hours
4. 75 days
5. 90 days

**17. To which phase of spermatogenesis does spermiogenesis belong?**

1. multiplication phase
2. growth phase
3. maturation phase
4. differentiation phase
5. proliferation

**18. In which stage of the growth period does a primary spermatocyte contain a tetraploid set of chromosomes?**

1. leptotene stage
2. zygotene stage
3. pachytene stage
4. diplotene stage
5. proliferation

**19. Which stage of gametogenesis is absent in oogenesis?**

1. multiplication
2. growth
3. maturation
4. differentiation
5. proliferation

**20. During which stage of gametogenesis are polar bodies formed?**

1. multiplication
2. growth
3. maturation
4. differentiation
5. proliferation

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Compiled by:  
Candidate of Medical Sciences, Associate Professor  
***O.P. Kalugina***

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