

1st questions - general histology

1. Cytology. * Cytology. Definition. General structure of the cell. Biological membranes. Membranous organelles of cells.

** Chemical composition and organization of molecules in the biomembrane. Fluid-mosaic model of membrane structure. Basic positions of the fluid-mosaic model (arrangement of molecules, selective permeability), types of proteins in cell membrane.

*** The role of proteins and cholesterol in functional activity and membrane specialization. Protein transporters, ion channels, pumps, enzymes, receptors.

2. Cytology. * The general plan of cell structure. Cell membrane. Features of the structure (layers). Functions of cell membrane.

** Transmembrane transport (simple diffusion, facilitated diffusion, active transport), endocytosis (pinocytosis, phagocytosis, transcytosis), exocytosis (secretion, excretion).

*** Morphological manifestations and molecular bases of different types of transmembrane transport.

3. Cytology. * Structure of cells. Molecular composition and organization of molecules in biomembranes. Membranous organelles of cells.

** Cell membrane structural features. Structure and function of the glycocalix. Microvilli, basal striations. Intercellular junctions, their types.

*** Regulation of cell activity. Cell signaling. Interaction of cells with the intercellular matrix.

4. Cytology. * Cell - the morphological basis of extracellular organisms, the main components of cells. Cytoplasm: general characteristics and composition.

** Hyaloplasm (cytosol): definition, physicochemical features, significance in cell metabolism. Proteasomes, structure and functions.

*** Proteasomes, their role in control of hyaloplasm protein assembly. The role of proteasome dysfunction in age-associated human diseases.

5. Cytology. * Basics of cell theory. General characteristics of the cytoplasm and its structural components. Organelles, definition, morphological and functional classification.

** Synthetic apparatus of cells, organelles of synthesis. Endoplasmic reticulum, ribosomes - structure, location, functions. Free ribosomes: structure, molecular organization, functional significance. Polyribosomes. The role of ribosomes in protein synthesis.

*** Molecular organization and formation of ribosomes and endoplasmic reticulum.

6. Cytology. * Cell - the morphological basis of multicellular organisms. The general plan of cell structure. Cytoplasm - definition and composition. Classification of organelles and inclusions.

**** Non-membranous organelles of general and special purpose. Cytoskeleton:** intermediate filaments, microfilaments, microtubules. Classification, structure and functions of the microfilaments and microtubules. Organization of the microtubules in centrioles, axoneme, cilia and flagella.

***** Molecular structure of microtubules, effect of polymerization and depolymerization of tubulins, role in cell life. Movement of organelles and vesicles along microtubules with the participation of kinesin and dynein proteins.**

7. Cytology. * Cell theory is the basis of cytology. Structure of cells in multicellular organism. Structural composition of the cytoplasm. Cytoplasmic membranous organelles. Structure and functions of smooth endoplasmic reticulum.

**** Relation of membranous structures in cytoplasm, and their cooperation in physiological cell processes. Synthesis, exocytosis, catabolism, endocytosis.**

***** Role of endoplasmic reticulum in dysfunction, aging and cell death.**

8. Cytology. * The general plan of cell structure. The composition of the cytoplasm. Organelles - definition, classification. The value of organelles in cell life. Structure and functions of smooth endoplasmic reticulum.

**** Specialization functions of smooth endoplasmic reticulum. Its role in the restoration of the nuclear envelope after mitosis.**

***** Detoxification system in the cell. Organelles and their functions. Peroxisome marker enzymes.**

9. Cytology. * Definition of cytology. General structure of the cell. The cell is the smallest level of organization. Organelles: definition, classification. Structure and functions of Golgi complex.

**** Connection of Golgi complex with endoplasmic reticulum. Role in lysosome formation.**

***** The role of the Golgi complex in plasmolemma remodeling and cell secretory activity. Exocytosis - mechanism and functional value.**

10. Cytology. * The properties of the cell as a structural unit of life living. Mitochondria - features of the structure, functions.

**** Features of structure of mitochondrial membranes and matrix. The role of mitochondria in lipid and carbohydrate catabolism, ATP production and thermoregulation, in the synthesis of steroid hormones.**

***** The concept of mitochondrial diseases. Mitochondrial regulators of apoptosis and cell survival.**

11. Cytology. * Key points of cell theory. Membranous organelles of cells, their classification. Lysosomes and peroxisomes. Their similarity and difference. Types of lysosomes and role in cell life. Phagolysosomes and autolysosomes.

**** Peroxisomes, functional value. Lysosome and peroxisome marker enzymes.**

***** The concept of lysosomal accumulation diseases and congenital peroxisome pathology.**

12. Cytology. * Cell is the smallest structural unit of multicellular organisms. General plan of cell structure, components of cytoplasm. Inclusion as a product of endocytosis and metabolic activity of cells. Classification of inclusions.

** Chemical composition and methods of studying of inclusions.

*** The role of inclusions in cell activity. Their connection with organelles.

13. Cytology. * The structure of eukaryotic cells. General characteristics and functions of nucleus. Nuclear-cytoplasmic correlation in different cell types. Changes in the structure of the nucleus at different functional states of the cell. Main components of the nucleus.

** Nuclear membrane structure. Structure and functions of the nuclear envelope. Nuclear pore complex. Types of transport between nucleus and cytoplasm.

*** Molecular organization of the nuclear pore complex. The number and value of nuclear pores in the cell functional activity.

14. Cytology. * An eukaryotic cell as the basis of structure, function and reproduction of multicellular organisms. The value of the nucleus in the life of the cell. The general structure of a nucleus. Chromatin, chemical composition, types, functional value.

** Structural characteristics of chromatin by light and electronic microscopy. Levels and mechanisms of chromatin packing (nucleosomes, fibrils, loops, chromosomes). Relationship of chromatin with protein synthesis.

*** Nucleolus. Structural components. Functions of nucleolus.

15. Cytology. * Cell theory: main statements. Cell cycle, phases. Stem cells, features.

** Cell cycle: interphase. Mitosis: phases, morphological manifestations, regulators. Cell differentiation and their exit from the cell cycle, G-phase characteristic.

*** Polyploidy, endomitosis and cell fusion - mechanisms of tissue reproduction and the formation of postcellular structures (sympasts and syncytium).

16. Cytology. * Features of cell functioning in the multicellular organism. Cell cycle: phases. Morphofunctional characterization of undifferentiated, low-differentiated and aging cells.

** Types of cell death: their characteristics, morphological manifestations and meaning for the body.

*** Autophagy as a mechanism of intracellular regeneration and caspase-independent apoptosis. Types of autophagy (macro-, micro- and chaperone-independent autophagy). Regulators and molecular markers of apoptosis.

17. Embryology. * Human embryogenesis. Periods of human embryogenesis development - initial, embryonic and fetal periods. Gametogenesis - features of the structure, development of gametes.

**** Ultrastructure of spermatozoa.** Membrane, acrosome, centrioles, mitochondrial sheath, axonema. The value of dynein in motility of the axonomic complex: types of sperm by karyotype.

***** The morphological basis of male infertility:** sterility, motility disorders etc.

18. Embryology. * Periods of human embryonic development. Characteristic of the initial period. Gametogenesis. Features of oogenesis and structure of the ovum.

**** Microscopic structure of oocyte:** amount and distribution of yolk sac, cortical granules, their importance in human embryogenesis.

***** Function of yolk and the mechanism of cortical reaction.**

19. Embryology. * The initial period of human embryogenesis. Fertilization. Stages of fertilization – distant and contact interaction of gametes, penetration. Localization of the fertilization process. The structure of the zygote.

**** Mechanisms of capacitation, chemotaxis, acrosomal and cortical reactions.**

***** Clinical significance of extracorporal (artificial) fertilization.**

20. Embryology. * Early stages of embryogenesis. Cleavage: duration, localization, features in humans. Blastomers.

**** Stages of germ formation during cleavage - morula, cell determination (trophoblast and embryoblast formation), early and late blastocyst, hatching.**

***** Embryonic stem cells:** properties, functional differences of pluri- and multipotent stem cells. Possibility of use in reparative medicine.

21. Embryology. * Prenatal human ontogenesis, definition. Gastrulation - the essence, phases, timing. Early gastrulation in humans: delamination, formation of hypoblasts and epiblasts, cell migration. Formation of extraembryonic organs.

**** Implantation:** localization, conditions, characteristics. Phases of implantation. The structure of the chorion, type of nutrition the embryo during implantation.

***** Endometrial and trophoblast morphogenesis at implantation. Implantation defects. Causes of ectopic pregnancy.**

22. Embryology. * Stages of embryogenesis. Gastrulation, features of gastrulation in humans. Late gastrulation: embryonic disc, cell migration, primitive streak and primitive node formation. Formation of mesoderm and notochord.

**** Neurulation and morphogenesis of the nervous system.**

***** Embryonic induction, role in histo- and organogenesis.**

23. Embryology. * Embryogenesis, definition. Stages of embryogenesis. Formation of axial organs of embryo: neurulation, differentiation of the mesoderm: notochord, somites, splanchnotome, mesenchyme and its derivatives.

**** Histogenesis.** Differentiation of definitive tissues from germinal layers and axial organs.

***** Mechanisms of histogenesis:** in committing, determination, migration, differentiation.

24. Embryology. * Features of human embryonic development. Stages of embryogenesis. Sources of extraembryonic organs formation. Chorion - structure, parts. Amniotic and yolk sacs, allantois - their structure and importance in the development of the embryo.

** Types of nutrition of embryo. Chorionic villus classification. Placenta: parts, structure, functional. The umbilical cord structure.

*** Critical periods of development. Multiple pregnancy. Mono- and dizygotic twins.

25. Embryology. * Embryonic period of prenatal ontogenesis. Differentiation of germ layers. Formation of the embryo body – body flexion, the formation of the primary gut, stomatodeum and proctodeum.

** Allantois formation, its structure and role in placentation. The umbilical cord structure.

*** Placenta: terms and sources of placental formation, parts. Features of the structure of the human placenta. The structure of the amnion.

2nd questions - general histology

1. General histology. * The definition of tissue. Morpho-functional and phylogenetic classification of tissues.

** Characterization of non-cellular structures, their representation in tissues. Interaction of cells and non-cellular structures in tissues.

*** Molecular-genetic basis of cell determination and differentiation in tissues. The concept of differon.

2. General histology * The definition of the tissues. Morpho-functional and phylogenetic classification of tissues. The general plan of tissue structure.

** Tissue as a system of histological elements. Differon and stem cells.

*** Tissue development in onto- and phylogenesis as the realization of the principles of determination and cell committing. Stem cells, their characteristics. Transdifferentiation.

3. General histology * Definition of a tissue. Structural components of tissues. Morphological basis of organ structure. Interaction of tissues in organs, the concept of structural and functional units.

** Histological tissue elements - cells and cellular derivatives: 1) non-cellular structures; 2) extracellular matrix. Interaction of cells and non-cellular structures in tissues.

*** Principles of tissue formation: determination, commitment and differentiation. Molecular-genetic basis of cell determination and differentiation in tissues. The concept of differon.

4. General histology. * General and special tissues. The value of tissues in the organ formation. The definition of stroma and parenchyma.

** Interconnection of tissues in organs, reparative and physiological regeneration of tissues, regenerative possibilities of different tissues.

*** The importance of keilons in the processes of vital activity and tissue regeneration.

5. General histology. Epithelial tissue. * Features of structure and functioning of epithelial tissues. Types of epithelium.

** Features of simple and stratified epithelium. Morphological characteristics of pseudostratified epithelium, its location and functional features.

*** Embryogenesis of the integumentary epithelium. Physiological and reparative regeneration of epithelial tissues, stem cells of epithelial tissues.

6. General histology. Epithelial tissue. * General morpho-functional characteristics: location, composition, features of cell structure and intercellular junctions. Morphological and histogenetic classification of the epithelial tissue. Structure of the basement membrane.

**** Simple epithelium:** types, localization, structure, polarity, functions, sources of development. Features of structure and location of pseudostratified columnar epithelium in the human body.

***** Specialization of the plasmolemma of epithelial cells:** intercellular junctions, microvilli, cilia, their molecular structure and significance.

7. General histology. Epithelial tissue. * Morphological and functional features of epithelial tissues. Classification.

**** Stratified epithelium:** types, localization, structure, functions. Features of structure and location of transitional epithelium.

***** Embryonic sources of stratified epithelium development.** Physiological and reparative regeneration of epithelium, cambial stem elements in epithelial tissues.

8. General histology. Epithelial tissue. * Glandular epithelium - features of functioning and location. Glands - definition, types and origin of them. Unicellular and multicellular glands. Endocrine and exocrine glands.

**** Features of structure and location of exocrine glands.** End sections and excretory ducts. Principles of exocrine glands classification.

***** Vascularization, innervation and age-related changes in endocrine glands.**

9. General histology. Epithelial tissue. * Glandular epithelium - features of functioning and synthetic activity of secretory cells. Secretory products and secretion. Exocrine and endocrine secretion.

**** Features of structure and classification of endocrine glands, features of secretion.** Paracrine and autocrine secretion.

***** Embryogenesis of endocrine and exocrine glands.** Histogenesis of the stroma and gland parenchyma.

10. General histology. Epithelial tissue. * Types of epithelium. Glandular epithelium. Features of structure and functioning of glandular secretory cells. Secretory products and secretion.

**** The secretory cycle, phases, the involvement of organoids in the secretory cycle.** Types of secretion (merocrine, apocrine, holocrine).

***** Morphological features and examples of glands with different types of secretion.**

11. General histology. Tissues of the internal environment. Blood.

*** General characteristics of tissues of the internal environment, classification.** Features of structure, origin and functions of blood and lymph.

Characteristics of formed elements, composition and origin of blood plasma and lymph. Hematocrit.

**** General characteristics of blood formed elements:** non-nuclear, nuclear and non-cellular. Hemogram, its main indicators and diagnostic value. Age features of hemogram.

*** Embryonic and post-embryonic blood histogenesis. Features of physiological and reparative regeneration of blood cells. Homoblastic and heteroblastic types of hematopoiesis.

12. General histology. Tissues of the internal environment. Blood.

* General characteristics of formed elements and intercellular substance of blood. Erythrocytes. Quantity, features of structure, function. Erythrocyte lifespan.

** Diagnostic significance of changes in the number, shape and size of red blood cells. Physiological and pathological poikilo- and anisocytosis.

*** Stages of the erythropoiesis.

13. General histology. Tissues of the internal environment. Blood.

* Characteristics of blood as tissue of the internal environment. Blood and plasma elements. Platelets: number, size, function. Platelet lifespan.

** Structure of the platelet: granulomer and hyalomer; granules and their contents. Types of platelets.

*** Stages of the thrombocytopoiesis.

14. General histology. Tissues of the internal environment. Blood.

* Characteristics of blood cells. Leukocytes: count, classification and features of the structure of granulocytes and agranulocytes, their functions and role in the protective reactions of the body. Leukocyte formula - its main indicators.

** Diagnostic significance of changes in leukocyte count (leukocytosis and leukopenia) and changes in leukocyte formula. Left and right shift of the leukocyte formula.

*** Embryonic hematopoiesis. Characteristics of mesenchymal-yolk period, differentiation of mesenchymal cells of blood islands.

15. General histology. Tissues of the internal environment. Blood.

* Blood - tissue of the internal environment. Features of its structure, origin and composition of the plasma. The general characteristic of the formed elements of blood - features of their structure. Classification of leukocytes.

** Agranulocytes - structure of monocytes and lymphocytes. Percentage in leukocyte formula, sizes.

*** Features of lymphopoiesis - antigen-dependent and antigen-independent differentiation. Differentiation of monocytes into macrophages and antigen presenting cells (dendritic and interdigitating).

16. General histology. Tissues of the internal environment. Blood.

* Features of formed elements and intercellular substance of blood. Plasma and serum. Formed elements of blood - leukocytes. The general plan of structure, count of each type, classification.

** Granulocytes - features of nucleus structure, staining and composition of granules, classification, percentage in leukocyte formula, features of the cell cycle.

*** Clinical significance of neutrophils, eosinophils and basophils.

17. General histology. Tissues of the internal environment. Lymph.

* Origin of lymph, its composition and location. Characteristics of lymphoid cells. Percentage of lymphocytes and macrophages.

** Blood and plasma lymphocytes, their structure, percentage in leukocyte formula, sizes and varieties.

*** Features of lymphocytopoiesis. Antigen-dependent and antigen-independent differentiation, progenitor cells and effector cells of T- and B-lymphocytes. Characteristics of NK-cells (natural killer cells).

18. General histology. Tissues of the internal environment. Connective tissue.

* General characteristics of connective tissue – its composition, features of structure and origin of the intercellular substance. Classification of connective tissue. Proper (fibrous) connective tissue - features of the cellular composition and structure of the intercellular matrix of fibrous tissues and connective tissues with special properties.

** Intercellular matrix of connective tissues - origin and characterization of structural components. Amorphous ground substance: the structure, chemical composition and functional significance of its elements. Types of fibers and their role in determining the properties of fibrous connective tissues.

*** Origin and stages of formation of fibrous structures and basic substance of connective tissues.

19. General histology Tissues of the internal environment. Fibrous connective tissues. * General characteristics of cells and intercellular substance of fibrous connective tissues, principles of classification, varieties.

** Loose fibrous connective tissue: general structure, localization, functions. Cells of loose connective tissue: embryonic sources of origin. Resident and transient cells. Fibroblastic differon: composition, structure and function of cells of this differon.

*** Interaction of blood formed elements and loose connective tissue with inflammation.

20. General histology. Tissues of the internal environment. Fibrous connective tissue. * The general plan of structure and classification of proper connective tissues. Fibrous connective tissue and connective tissue with special properties: fundamental differences of their structure.

** Connective tissue with special properties: classification. Features of the structure and localization of different types of adipose tissue.

*** Ultrastructure of white and brown adipose tissue lipocytes, features of their metabolism.

21. General histology. Tissues of the internal environment. Connective tissue with special properties. * Features of structure and principles of classification of special connective tissue.

** Reticular tissue: structure and location. Characteristics of cells and intercellular substance.

*** Mucous and pigmented tissue. Features of cell origin and structure of intercellular substance. Localization of these tissues in the human organism.

22. General histology. Tissues of the internal environment. Fibrous connective tissue. * Composition of fibrous connective tissues. Characteristics of the intercellular substance of fibrous connective tissue: fibers and basic substance - chemical composition and origin.

** Features of composition and structure of intercellular substance of loose connective tissue. Stages and levels of formation of collagen and elastic fibers, their physical and chemical properties.

*** Chemical composition and organization of the ground substance of loose connective tissue. Its properties, values and features in children.

23. General histology. Tissues of the internal environment. Fibrous connective tissues. * General plan for the structure of fibrous connective tissues. Characteristics of cells and intercellular substance. Principles of classification of fibrous connective tissues. Loose and dense fibrous connective tissues. Their morphological similarities and differences.

** Morphological features of dense fibrous connective tissue. Features of cellular composition and structure of the intercellular substance of dense fibrous connective tissue. Classification and localization of varieties of dense connective tissue.

*** Organization of the bundles in tendons and elastic ligaments.

24. General histology. Tissues of the internal environment. Skeletal tissue. * General morpho-functional characteristics of skeletal tissues, features of the structure of intercellular substance of bone and cartilage, principles of classification. Cartilage. Morpho-functional features of the structure and vital activity of cartilage. Presence of isogenic groups of cells, diffuse type of nutrition, properties of intercellular substance, features of cartilage growth in histogenesis.

** Features of structure of hyaline cartilage tissue and hyaline cartilage. Articular cartilage: structure, function, localization.

*** Features of cartilage growth. Metaepiphyseal growth plate. Tissue composition of the zone and features of functioning.

25. General histology. Tissues of the internal environment. Skeletal tissues. * Cartilaginous tissues - a general plan of structure and morpho-functional features of cartilage cells and intercellular substances: properties of the basic substance, diffuse type of nutrition, isogenic groups of cells. Principles of classification.

** Elastic cartilage: localization, features of structure of the intercellular substance and its properties, functions. Features of elastic cartilage - the presence of cartilage and the ability to calcify.

*** Stages of cartilage histogenesis. Regeneration and age-related changes in cartilage.

26. General histology. Tissues of the internal environment. Skeletal tissue. *

Cartilage: general characteristics of cells and intercellular substance - properties of the basic substance, isogenic groups of cells, diffuse type of nutrition.

** Fibrous cartilage tissue: features of structure, localization, functions. The structure of the intervertebral disc: tissue composition, functions. The mechanism of formation of disc hernia.

*** Degenerative changes in cartilage during aging. The ability to calcify and regenerate.

27. General histology. Tissues of the internal environment. Skeletal tissue. *

Bone tissue: morpho-functional features - cells, intercellular substance. Varieties of bone tissue, variants of organization of bone substance.

** Woven bone tissue: localization, cell types, features of the structure of the intercellular substance and the form of woven bone tissue organization, its structural and functional unit.

*** Direct osteogistogenesis: embryonic cell sources. Stages of formation of woven and lamellar bone tissue.

28. General histology. Tissues of the internal environment. Skeletal tissue. *

Bone tissue: general characteristics of cells and intercellular substance, classification of bone tissue by the structure of the intercellular substance, methods of organization of bone substance in bones.

** Lamellar bone tissue: varieties of bone plates in the diaphysis of the long bones, structure of the osteon. Long bone: histoarchitectonics in different areas of long bone. Compact and spongy components of bones.

*** Indirect osteohistogenesis: conditions of its course, perichondral and endochondral osteohistogenesis, formation of metaepiphyseal cartilage growth plate. Long bone growth in thickness and length.

29. General histology. Skeletal tissue. Types of conjunction of bones. *

Syndesmosis, synostosis, synchondrosis - location and features of the structure.

** Joints - organs formed by skeletal tissue. Varieties, structure. Articular cartilage, articular capsule, subchondral bone: features of structure, role in histophysiology of joints.

*** Synovial cells, their role in the production of hyaluronic acid, in the development of inflammation and destruction of articular cartilage.

30. General histology. Muscle tissues. *

Features of the structure and function of muscle tissues. Morpho-functional and histogenetic classification. Skeletal muscle tissue: features of structure and functions, location in the body. Muscle fiber structure: myosimplast and myosatellites, sarcolemma and basement membrane, general and special organelles.

** Structure of striated myofibrils. Sarcomere, the formula of a sarcomere. The mechanism of striated myofibrils contraction.

*** Embryonic sources of development and histogenesis of skeletal muscle tissue.

31. General histology. Muscle tissues. * General morphological features and classification of muscle tissues. Striated cardiac muscle tissue: localization, features of structure, characteristics of contraction. Structural and functional organization of cardiac muscle tissue.

** Structure of cardiomyocytes, types of junctions in functional fibers. Types of cardiomyocytes, their localization, features of structure, functions.

*** Sources of development and histogenesis of striated cardiac muscle tissue.

32. General histology. Muscle tissues. * Morphofunctional features of the structure and classification of muscle tissues. Smooth muscle tissue: localization, structural and functional organization of tissue, characteristic of tonic contraction in smooth muscle.

** Ultrastructure of smooth myocytes, arrangement of actin and myosin filaments). Histogenesis of smooth muscle tissue.

*** Myoepithelial cells and myocyte secretory type - location, function.

33. General histology. Muscle tissue. * Features of the structure and classification of the striated muscle tissue. Cell-symplastic organization of skeletal muscle tissue.

** Features of the skeletal muscle fiber structure. Tubules, terminal cisternae of the endoplasmic reticulum, triads, their value in fiber contraction.

*** Molecular mechanisms of skeletal muscle fiber contraction, its involvement in its structural components.

34. General histology. Muscle tissue. * Composition and features of skeletal muscle tissue functioning. Cell-symplastic structure of skeletal muscle tissue.

** Red and white muscle fibers, features of the structure and location of the muscles. Characteristics of skeletal muscle contractions.

*** Muscle structure as an organ: tissue composition (endomysium, perimysium, and epimysium), structural and functional unit, tendon communication.

35. General histology. Nervous tissue. * Morpho-functional features of the structure of nervous tissue. Neurocytes (neurons): a general plan of structure. Classification of neurons.

** Pericarion structure. General and special organelles. Intracellular transport and axonal transport. Features of structure of nucleus and life cycle of neurons. Neurosecretory cells - location, functions.

*** Sources of embryonic development of structural elements of Nervous tissue and its ability to regenerate.

36. General histology. Nervous tissue. * Composition and functional features of nervous tissue. Gliocytes: general characteristics, sources of origin, functional value.

Classification. Glia of the central and peripheral nervous system. Microglia and macroglia.

**** Ependymocytes and astrocytes - location, features of structure and functional significance.**

***** Hemato-encephalic and hemato-liquor barriers, structural components, role of gliocytes in their formation.**

37. General histology. Nervous tissue. * General morphofunctional characteristics and structural components of nervous tissue. Organization of nerve and glial cells in reflex arcs. Neurolemocytes: structure, functional significance, role in nerve fiber membrane formation.

**** Nerve fibers: composition, classification, localization in the central and peripheral nervous system. Structure of myelinated and unmyelinated nerve fibers, impulse conduction characteristics.**

***** Regeneration of nerve fibers after injury.**

38. General histology. Nervous tissue. * The composition and morpho-functional organization of Nervous tissue. Functional classification of neurons, their location in reflex arcs. Nerve endings: classification, types.

**** Synapses: varieties, structure, classification.**

***** Synapse excitation principles of the synapse functioning mechanism. Mediators (neurotransmitters).**

39. General histology. Nervous tissue. * The general plan of structure of a nervous tissue and its structural elements. Communication and functional types of neurons in reflex arcs. Simple and complex reflex arcs.

**** Nerve endings: classification, types.**

***** Receptor (afferent) nerve endings: classification (free and involuntary, encapsulated and unencapsulated), structure, localization, functional value.**

40. General histology. Nervous tissue. * Nervous tissue cells. Functional and morphological classifications of neurons in nervous tissue. Location and classification of neurons and glia in the central and peripheral nervous systems.

**** Oligodendroglyocytes, neurolemmocytes and satellite cells: features of structure, location and functions. Differences in myelination of nerve cell processes by oligodendroglyocytes and lemmocytes.**

***** Classification of the nerve endings. Neuromuscular junctions. The mechanism of transmission of impulse in it.**

41. General histology. Tissues of the internal environment. Blood.

*** General characteristics of tissues of the internal environment, classification. Features of structure, origin and functions of blood and lymph.**

Characteristics of cells and intercellular substance, composition and origin of blood plasma and lymph. Hematocrit.

** General characteristics of blood cells: non-nuclear, nuclear and non-cellular. Hemogram, its main indicators and diagnostic value. Age features of hemogram.

*** Embryonic and post-embryonic blood histogenesis. Features of physiological and reparative regeneration of blood cells. Homoblastic and heteroblastic types of hematopoiesis.

42. General histology. Tissues of the internal environment. Blood.

* General characteristics of cells and intercellular substance of blood. Erythrocytes. Quantity, features of structure, function. Life cycle duration.

** Diagnostic significance of changes in the number, shape and size of red blood cells. Physiological and pathological poikilo- and anisocytosis.

*** Erythropoiesis of heteroblastic type. Morphological manifestations of erythrocyte cell differentiation.

43. General histology. Tissues of the internal environment. Blood.

* Characteristics of blood as tissue of the internal environment. Blood and plasma elements. Platelets: number, size, function. Life cycle duration.

** Structure of the platelet: granulomer and hyalomer; granules and their contents. Types of platelets.

*** Which cells arise from colony-forming units of megakaryocytes.

44. General histology. Tissues of the internal environment. Blood.

* Characteristics of blood cells. Leukocytes: the amount in 1 liter of blood, classification and features of the structure of granulocytes and agranulocytes, their functions and role in the protective reactions of the body. Leukocyte formula - its main indicators.

** Diagnostic significance of changes in leukocyte count (leukocytosis and leukopenia) and changes in leukocyte formula. The left and right shift of the leukocyte formula.

*** Embryonic blood development as a tissue. Characteristics of mesenchymal-yolk period, hematopoiesis, differentiation of mesenchymal cells of blood islands.

45. General histology. Tissues of the internal environment. Blood.

* Blood - tissue of the internal environment. Features of its structure, origin and composition of the intercellular substance. The general characteristic of the formed elements of blood - features of their structure. Classification of leukocytes.

** Agranulocytes - structure of monocytes and lymphocytes. Percentage in leukocyte formula, sizes and varieties.

*** Features of lymphopoiesis - antigen-dependent and antigen-independent differentiation. Differentiation of monocytes into macrophages and antigen presenting cells (dendritic and interdigitating).

neral histology. Tissues of the internal environment. Blood. * Blood - tissue of the internal environment. Features of its structure, origin and composition of the

intercellular substance. The general characteristic of the formed elements of blood - features of their structure. Classification of leukocytes.

**** Agranulocytes** - a general plan for the construction of monocytes and lymphocytes. Percentage in leukocyte formula, sizes and varieties, role in providing specific immunity - effector cells.

***** Features of lymphocytopoiesis** - antigen-dependent and antigen-independent differentiation. Differentiation of monocytes into macrophages and antigen presenting cells (dendritic and interdigitating).

46. General histology. Tissues of the internal environment. Blood.

*** Features of cells and intercellular substance of blood.** Plasma and serum. Formed elements of blood - leukocytes. The general plan of structure, quantity in 1 liter of blood, classification.

**** Granulocytes** - features of nucleus structure, staining and composition of granules, classification, percentage in leukocyte formula, features of the cell cycle.

***** Clinical significance of neutrophils, eosinophils and basophils.**

47. General histology. Tissues of the internal environment. Lymph.

*** Origin of lymph, its composition and location.** Characteristics of lymphoid cells. Percentage of lymphocytes and macrophages.

**** Blood and plasma lymphocytes, their structure, percentage in leukocyte formula, sizes and varieties.**

***** Features of lymphocytopoiesis.** Antigen-dependent and antigen-independent differentiation, progenitor cells and effector cells of T- and B-lymphocytes. Characteristics of NK-cells (natural killer cells).

48. General histology. Nervous tissue. *** Morpho-functional features of the structure of nervous tissue.** Neurocytes (neurons): a general plan of structure. Classification of neurons.

**** Pericaryon structure.** General and special organoids. Intracellular transport and axonal transport. Features of structure of nucleus and life cycle of neurons. Neurosecretory cells - location, functions.

***** Sources of embryonic development of structural elements of Nervous tissue and its ability to regenerate.**

49. General histology. Nervous tissue. *** Composition and functional features of nervous tissue.** Gliocytes: general characteristics, sources of origin, functional value. Classification. Glia of the central and peripheral nervous system. Microglia and macroglia.

**** Ependymocytes and astrocytes** - location, features of structure and functional significance.

***** Hemato-encephalic and hemato-liquor barriers, structural components, role of gliocytes in their formation.**

50. General histology. Nervous tissue. * General morphofunctional characteristics and structural components of Nervous tissue. Organization of nerve and glial cells in reflex arcs. Neurolemocytes: structure, functional significance, role in nerve fiber membrane formation.

** Nerve fibers: composition, classification, localization in the central and peripheral nervous system. Structure of myelin and myelin nerve fibers, impulse conduction characteristics.

*** Regeneration of nerve fibers after injury.

3rd questions

1. **Special histology. Nervous System.** * Nervous system: general morpho-functional characteristics, classification, tissue composition of organs. Organization of nerve tissue in central nervous system. Gray and white matter. Cerebral cortex: layers, morphological types of neurons, functions.

** Cerebral cortex: histophysiology, cytoarchitectonics, and myeloarchitectonics, structural and functional unit. Morphological types of cortex, connection with functions.

*** Brain: embryonic sources and process of development. Primary cerebral vesicles, their derivatives, features of embryogenesis of gray and white brain matter.

2. **Special histology. Nervous system.** * Central nervous system: composition, location. Cerebrum: parts, general structure of the parts, location of gray matter. Cerebellum: localization, general structure, functions.

** Cerebellar cortex: layers, cytoarchitectonics, neuron composition of layers, afferent and efferent fibers.

*** Interneuron connections of excitation and inhibition in cerebral cortex.

3. **Special histology. Nervous system.** * organs of nervous system. Classification, general plan of structure of the organs of the central nervous system. Spinal cord: localization, features of the location of gray and white matter, the functions of the constituent components.

** Gray matter: horns, nuclei, neural connections with other CNS organs, neuron composition by structure and function.

*** White matter of the spinal cord: funiculi, their structural composition, functional value. Neural pathways.

4. **Special histology. Nervous system.** * Morphological basis of nervous system activity. Organs of the nervous system and their place in the reflex arcs. Somatic reflex arc: localization of neurons in the organs of the nervous system, interneuronal connections, functional significance of somatic reflex arcs.

** Vegetative reflex arc: localization and functional significance of neurons, interneuronal connections of vegetative reflex arcs.

*** Significance of central nervous system organs in reflex arcs.

Sources and stages of development of the central nervous system

5. **Special histology. Nervous System.** * Peripheral nervous system, composition. Nervous ganglia (cerebrospinal, ganglia of the cranial nerves, vegetative). Spinal ganglia: localization, general plan of structure, functions. Tissue composition, neurons, gliocytes.

** Reflex arcs: constituent elements, localization of neurons, interneuronal connections, functional value. Simple and complex reflex arcs.

*** Sources and course of development of the peripheral nervous system.

6. **Special histology. Nervous System.** * General morphofunctional characteristics of the autonomic nervous system: functional significance, parts.

** Autonomous (vegetative) ganglia. Varieties, arrangement in the body, tissue and cellular composition.

*** Vegetative reflex arcs: components, localization of neurons, interneuronal connections, functional value.

7. **Special histology. Nervous system.** * General morphofunctional characteristics of the nervous system. Organs and their functions. Peripheral nervous system: composition and location in the body. Peripheral nerve: general plan of structure, structural components. Endoneurium, perineurium, epineurium – tissue composition.

** Structural components of the mixed cerebral nerve, its tissue and functional components, types of nerve fibers, structure and functional significance.

*** Sources and development of the peripheral nervous system.

8. **Special histology. Sensory organs.** * Sensory organs, definitions. Classification of sensory organs. The organ of vision – the eyeball: structure (layers, internal parts). Functional eye apparatus. The composition and purpose of the diopter apparatus of the eye.

** Microscopic structure and tissue composition of the cornea, lens and vitreous body. Cornea: layers, features of trophic and innervation of the cornea. Factors that ensure the transparency of the cornea.

*** Embryogenesis of the eyeball. Sources of formation of components of the eye.

9. **Special histology. Sensory organs** * The doctrine of analyzers. The peripheral part of the visual analyzer – the eyeball: a general plan of the structure, the tissue composition of the membranes and their derivatives.

** Eye accommodation apparatus. Structure and functions of the iris and ciliary body. Tissue composition and functions.

*** The clinical significance of the malfunction of the eye accommodation apparatus. Myopia, hypermetropia and astigmatism.

10. **Special histology. Sensory organs** * Sensory organs – the peripheral parts of analyzers. The components of the visual analyzer and the structure of the eyeball. Functional eye apparatus.

** Photosensor apparatus of the organ of vision: retina, optic nerve, visual and blind spot of retina. Neural composition and layers of the visual part of the retina.

*** Photoreceptive mechanisms. Inverted human retina. Yellow and blind spots, histological structure.

11. **Special histology. Sensory system.** * General characteristic and classification of the sensory organs.

**** Receptor apparatus of the organ of vision - cellular composition, neurons and glial cells of the retina, layers of the retina**

***** Photoreceptor cells: species, number, localization, structure, functions. Cellular and molecular basis of photoreception. Stages of visual processing of energy of light rays**

12. Special histology. Sensory system. * Hearing and balance organ: anatomical parts, functional characteristics. External and middle ear: structure, functions.

**** Structure of external auditory meatus and tympanic membrane. Tympanic cavity and auditory ossicles. Epithelial lining, windows and auditory tube.**

***** Sources and development of the organ of hearing and balance. Origin of the outer, middle and inner ear.**

13. Special histology. Sensory system. * Definition of the sensory organs. The anatomical parts of organ of hearing and balance. The inner ear, structure, functions. Bony and membranous labyrinth.

**** Spiral organ of Corti: cells, cytophysiology.**

***** Types and cytophysiology of hair sensitive cells. Mechanism of perception of sounds and their transformation into nerve impulses.**

14. Special histology. Sensory system. * Hearing and balance organ: anatomical parts. Internal ear, structure of bony and membranous labyrinth. Vestibular apparatus, structure, cells.

**** Cells of maculae of a saccule, a utricle and a crista ampullaris. Cupula and otolithic membrane. Ultramicroscopic structure of hair cells.**

***** Histophysiology of the perception of linear acceleration, gravity and vibration.**

15. Special histology. Sensory system. *Visual analyzer, its structural components. The organ of vision. General structure, tissues and layers.

**** Functional apparatus of the eye: dioptrical, accommodative, receptor, accessory. Their composition and functions.**

***** Development of the eyeball.**

16. Special histology. Sensory system. *Visual analyzer, its structural components. General structure of the organ of vision. Dioptrical apparatus of the eye, structural components, general features of light-refractive structures.

**** Structure of the cornea, lens, vitreous body. Morphological basis of their transparency.**

***** Trophic of the dioptrical apparatus of the eye. Diseases related to the pathology of this apparatus.**

17. Special histology. Sensory system. *Visual analyzer, its structural components. General structure of the organ of vision. Accommodative apparatus of the eye.

**** The structure of the iris and ciliary body: layers, cells, muscles.**

***** The role of the accommodative apparatus in adaptation to the intensity of light and changing the shape of the lens.**

18. Special histology. Sensory system. *Visual analyzer, its structural components. General structure of an eyeball. Structure of the photoreceptor apparatus of the eye: neurons, glial cells, pigment epithelium.

**** Photoreceptor cells: types, number, localization, structure, functions.**

***** Visual pigment. Mechanisms of photoreception.**

19. Special histology. Sensory system. *Visual analyzer, its structural components. General structure of an eyeball. Photoreceptor apparatus of the eye: tissues, trophic.

**** Macula lutea. The optic nerve. The optic disc. Retinal trophic. The choroid, layers and structure.**

***** The main vascular complex. The hemato-retinal barrier.**

20. Special histology. Sensory system. *Visual analyzer, its structural components. The accessory apparatus of the eye: tear glands, conjunctiva and eyelids. The general plan of structure and functions.

**** Histological structure of eyelids. Structure, tissues. Glands of the eyelids: Meibomian and Zeiss glands. The lacrimal apparatus of the eye: the glands and the lacrimal ducts.**

***** Age changes of the eyeball.**

21. Special histology. Sensory system. *Statoacoustic system (organ of hearing and equilibrium). Auditory analyzer. Parts. Structural components, their functional role.

**** Ear: external ear – structural components, functional role. Middle ear – auditory ossicles, tympanic cavity, auditory (Eustachian) tube. Inner ear: bony and membranous labyrinths, structural components, perilymph.**

***** Embryonic origin and process of development of ear structural components.**

22. Special histology. Sensory system. *Statoacoustic system (organ of hearing and equilibrium). Auditory analyzer. Parts. Structural components, their functional role. Cochlear (auditory) part of membranous labyrinth. Location and structure of its walls. Endolymph.

**** Spiral organ of Corti: cellular composition, tectorial membrane.**

***** Cytophysiology of auditory apparatus.**

23. Special histology. Sensory system. *Statoacoustic sensory system (organ of hearing and equilibrium). Vestibular analyzer. Parts. Structural components, their functional role. Vestibular part of membranous labyrinth: utricle, saccule, and semicircular canals.

**** Receptive regions of vestibule: maculae, ampullary crests. Cellular composition of receptive regions: type I vestibulocytes, type II vestibulocytes (vestibular sensory hair cells), supporting cells.**

***Cytophysiology of vestibular sensory hair cells.

24. **Special histology. Sensory system.** * Sense organs, definition. Olfactory analyzer: parts, composition, functional role. Peripheral olfactory organ: general characteristics, localization.

**Olfactory epithelium: localization, cellular composition, mechanisms of perception of smell.

*** Embryogenesis and age-related changes in the olfactory organ

25. **Special histology. Sensory system.** *The third type of sense organs (which are built up as not anatomically defined organ). Morphological bases of cutaneous (exteroceptive), deep (proprioceptive) and visceral (interoceptive) sensitivity.

** Histological structure of free nerve endings, non-encapsulated and encapsulated sensory receptors. Tactile, pain, temperature sensitivity.

*** Sensory nerve endings: types, localization, functions, and significance. The structure of receptors that provide exteroceptive, proprioceptive and interoceptive sensitivity. Nociceptors. Merkel cells, receptors of vibration.

26. **Special histology. Sensory system.** *Sense organs, definition, classification. The second type of sense organs: secondary-sensitive – examples, general plan of the structure.

** Structure and localization of taste buds: the peripheral part of the gustatory analyzer.

***Histophysiology of taste perception.

27. **Special histology. Cardiovascular system.** * General plan of the structure of blood vessels. Arteries: classification, tissue composition of tunics of different types of arteries.

**Dependence of the structure and tissue composition of artery tunics on hemodynamic factors.

***Mechanisms of regulation of vascular tone and peripheral vascular resistance.

28. **Special histology. Cardiovascular system.** *Vessels of the microcirculation. Arterioles, venules: structure, functional role, comparative characteristics of their wall structure.

**Structural features of the endothelium: endotheliocyte zones, fenestrae, intercellular junctions.

***Histo-haematic barriers: localization, components.

29. **Special histology. Cardiovascular system.** *General characteristics. Classification and general plan of the structure of blood vessels. Vessels of macro-and microcirculation, their vascular composition.

**Blood capillaries: classification, structure, functional role of different types of capillaries.

***Histophysiology of transcapillary metabolism.

30. Special histology. Cardiovascular system. * Organs, parts and their general plan of the structure. Veins: functional significance, classification, structural features of the vein wall in relation to hemodynamic conditions.

**Comparative characteristics of the structure of the vein wall in correlation with the corresponding arteries: wall thickness, tissue composition, relative thickness of the tunics. Structure of venous valves.

***Structural features of the veins found in different organs of the human body. Histophysiology of veins. Fibrous veins, localization, structural features of their wall and their histophysiology.

31. Special histology. Cardiovascular system. *Lymphatic vessel. Classification of lymphatic vessels. Tissue composition of their wall tunics.

**Lymphatic capillaries: wall structural features in comparison with haemocapillaries: diameter, structure of the basal membrane and the location of endotheliocytes, the presence of pericytes and anchor filaments.

***Composition of lymph. Mechanisms of its formation. Clinical significance of elephantias (intraorganic lymph vessel insufficiency).

32. Special histology. Cardiovascular system. *Heart: general plan of the structure of the wall, tissue composition of the heart wall layers.

**Myocardium. Contractile apparatus of the heart. The conducting system of the heart. Secretory cardiomyocytes. The fibrous skeleton of the heart.

***Embryonic sources and the process of development of the heart: precordial splanchnopleura, myocardial plate. Participation of neural crest cells in the histogenesis of the heart.

33. Special histology. Skin and its appendages. *General morpho-functional characteristics of the skin: layers, tissue composition, functions. The subdivision of the skin into thick and thin.

**Structure and cellular composition of the epidermis. Structural peculiarities of the epidermis of the thin and thick skin.

***Embryonic sources of development of tissue components of the skin and cells of the epidermis. Development of the hair and skin glands. The concept of pilosebaceous unit.

34. Special histology. Skin and its appendages. *General morpho-functional characteristics. Layers, tissue composition, functions.

**Epidermis: layers, cellular composition, structural features of the thick and thin skin. Mechanisms and morphological signs of the keratinization process.

***Embryonic development of the skin and its appendages. The significance of neuroregulation in the formation of hair papillae.

35. Special histology. Skin and its appendages. *The general plan of the structure, zonal heterogeneity. The difference in the structure of the thin and thick skin.

****Dermis of the skin: layers, tissue and cellular composition. Epidermis-Dermis interface.**

****Features of the blood supply and innervation of the dermis: dermal vascular plexuses (superficial and deep), their composition and location.**

36. Special histology. Skin and its appendages. * Surface sensitivity of the skin. General description, types. Glands of the skin, localization, types. Structure and types of secretion of sweat and sebaceous glands, their importance for the human body.

****Apocrine and merocrine sweat glands: comparative characteristics. Structure and cellular composition of excretory ducts and secretory portions of sweat glands.**

*****Regulation of secretion of the skin glands. Their vegetative innervation and control by sex hormones.**

37. Special histology. Endocrine system. * General characteristics, functional significance: organs, cells, location, mechanism of action, biological effects. Hormones: the functional role in the human organism, their chemical nature.

****The central part of the endocrine system. Hypothalamus: parts, nuclei, structural and functional connections with other parts of the nervous and endocrine systems.**

*****Neurosecretory cells. Location, structural features. Axo-vasal synapses. Neurohaemal organs.**

38. Special histology. Endocrine system. *The central part of the endocrine system. Hypophysis. General plan of the structure. Neurohypophysis: structure, cells, axo-vasal synapses, Herring bodies, functional significance.

****Hypothalamic-neurohypophyseal system. Connection of the hypothalamus with the neurohypophysis.**

*****Embryonic origins and process of development of adeno- and neurohypophyses.**

39. Special histology. Endocrine system. *Components, their classification. Central organs of the endocrine system. Hypophysis, general plan of the structure and its functional significance.

****Adenohypophysis: parts, cellular composition. Cell types, their structure.**

Hormones, their targets and biological effects. Principles of regulation of functional activity of the adenohypophysis. Relationship between hypothalamus and adenohypophysis. Hypothalamic releasing hormones.

*****Hypothalamic-hypophyseal portal system, its role in transport of hormones and regulation of the synthesis of adenohypophyseal hormones.**

40. Special histology. Endocrine system. *Functional significance, structural components, classification. Adrenal glands: localization, general plan of the structure, functions.

****Adrenal cortex. Structure, zones, types of endocrinocytes. Hormones, their targets, and biological effects.**

***Hypothalamic-hypophyseal-adrenocortical system: principles of regulation of the adeno-hypophyseotropic action of the hypothalamus. The biological role of pituitary hormones in relation to the adrenal cortex.

41. Special histology. Endocrine system. * General plan of structure of peripheral endocrine glands, characteristic of the stroma and parenchyma. Thyroid gland: general plan of the structure, thyroid hormones, their target organs and biological effects.

** Structural and functional unit of the thyroid gland. Follicles: structure, cellular composition, features of the secretory cycle, its regulation by central endocrine organs.

*** Follicular reorganization due to different functional activity: follicle morphology in hyper- and hypofunction of the thyroid gland.

42. Special histology. Endocrine system. * Features of structure of endocrine glands, their importance for organism. The thyroid gland is the general plan of the structure, the structural organization of the parenchyma.

** Parafollicular cells (C-cells): localization, structure, regulation of secretion.

*** Sources of embryonic development of the thyroid gland. Origin of parafollicular cells.

43. Special histology. Endocrine system. * Features of structure of endocrine glands, their importance for organism. Parathyroid glands, location, characteristic of the stroma and parenchyma.

** Principles of regulation of calcium metabolism: hormones of thyroid and parathyroid glands, vitamin D. Mechanisms of realization of the biological effect of hormones.

*** Diffuse endocrine system. Neuroendocrine cells of the APUD system, localization, hormones and their effects.

44. Special histology. Endocrine system. * Classification of the endocrine system. Diffuse endocrine system. Organs that combine endocrine and exocrine functions. Localization and features of the structure of APUDocytes.

** Ultramicroscopic features of cell structure of diffuse neuroendocrine system.

*** Mechanisms of endocrine and paracrine regulation of target cells by apudocytes.

45. Special histology. Organs of hematopoiesis and immunogenesis.

* General morpho-functional characteristic, classification. Red and yellow bone marrow: localization, functions, importance for the body.

** Structure of the stroma and parenchyma of the red bone marrow.

*** Hemopoiesis in the red bone marrow. Classes of hematopoiesis cells. Cells of the microenvironment, their importance for hematopoiesis.

46. Special histology. Organs of hematopoiesis and immunogenesis.

* Principles of organization of hematopoietic organs. Structural features of stroma and parenchyma. Thymus: localization, structure, functions, structural-functional unit. Epithelioreticulocytes: origin, function, types. Hassall corpuscles.

**Involution of the thymus. Morphological features of age and accidental involution.

*** Embryogenesis and histophysiology of the thymus. Mechanisms of positive and negative selection of T-lymphocytes.

47. Special histology. Organs of hematopoiesis and immunogenesis.

* General principles of organization and classification. The spleen: structural features of the stroma, composition of the white and red pulp.

** White pulp of the spleen: zones, cellular composition, functions.

*** Features of the blood supply of spleen, interaction with functions of a spleen.

48. Special histology. Organs of hematopoiesis and immunogenesis.

* General features of the structure of myeloid and lymphoid organs. Spleen. Characteristics of the stroma and parenchyma, features of the capsule and trabecular structure.

** The red pulp of the spleen: components and their function. Types of blood circulation in the spleen.

*** Histophysiology of the spleen: monitoring of circulating blood by macrophages for the presence of antigens in it, recycling of T- and B-lymphocytes, rejection of old erythrocytes.

49. Special histology. Organs of hematopoiesis and immunogenesis.

* General features of the structure of the lymphoid organs. Lymph nodes: functions, functional zones, their structure, cellular composition and functional significance.

** The system of sinuses of lymph nodes. Histophysiology of lymph nodes.

*** Gut-associated lymphoid tissue. Structure and functions of the tonsils.

50. Special histology. Endocrine system.

* General plan of structure of peripheral endocrine glands, characteristic of the stroma and parenchyma. Thyroid gland: general plan of the structure, thyroid hormones, their targets organs and biological effects.

** Structural and functional unit of the thyroid gland. Follicles: structure, cellular composition, features of the secretory cycle, its regulation by central endocrine organs.

*** Follicular reorganization due to different functional activity: follicle morphology in hyper- and hypofunction of the thyroid gland.

4th Questions

1. **Special histology. Digestive System.** * Digestive tube: organs and parts. Digestive glands. Walls of an oral cavity - structure. Lips: zones, layers, features of the structure of mucous oral cav and transitional parts.

** Oral mucous glands: their location, structure and functions.

*** Development of oral cavity and face in embryogenesis, sources of lip and cheeks formation.

2. **Special histology. Digestive System.** *Parts of digestive tube. Anterior part of the digestive tube - structure. Oral cavity: structure and functions. Hard and soft palate: location and structure.

** Types of mucous membrane in the hard and soft palate. Hard palate: areas, submucosa, contact with periosteum.

*** Oral embryogenesis: stomatodeum and branchial apparatus. Oral cavity organs: embryonic development.

3. **Special histology. Digestive System.** * Oral cavity: structure. Organs of the oral cavity. Tongue: general structure, mucous membrane of the dorsal and ventral surfaces.

** Papillae of the tongue: definition, types, localization, structure, functions. Taste buds - location, structure.

*** Embryonic sources of tongue development. Innervation of tongue.

4. **Special histology. Digestive System.** * Morpho-functional characteristics of the middle part of digestive tube: layers and functions. Stomach: wall structure, regions, functions.

** Gastric mucosa: formations, tissues, structure in different regions.

*** Embryonic development of the stomach. Stomach lining: structure, functions, features of regeneration. The mucus-bicarbonate barrier.

5. **Special histology. Digestive System.** * Digestive tube: parts. Organs of middle part. Stomach - general structure. Layers of the stomach.

** Gastric glands: localization, types, structure. Gastric glands of the stomach: parts, cells, functions. Main and parietal exocrinocytes: structure, functions, regulators of secretory activity.

*** Stomach: composition of gastric juice, function of superficial mucocytes, formation of chyme, path of chyme into the duodenum, gastric innervation.

6. **Special histology. Digestive System.** * General plan of structure of a digestive tube: parts, layers. Organs of the middle part of digestive tube. The small intestine, structure of mucosa. Epithelium of the small intestine: epithelial cells of villi and crypts, types of enterocytes, functions.

** Microstructure of columnar and Goblet cells, M cells, Paneth cells. Endocrine cells of the small intestine: types, localization, structure.

*** Intestinal stem cells: localization, markers. Regeneration of epithelium of the small intestine, the duration of complete replacement of epithelium of villi.

7. Special histology. Digestive System. * The large digestive glands, their role in digestion and metabolism. Pancreas: exo- and endocrine parts, connection with the digestive tract.

** Exocrine part of pancreas – functional unit. Exocrinocytes - structure. Centroacinar cells.

*** Pancreatic secretion: secretory cycle, type, regulation. Diffuse neuroendocrine system in regulation of secretion.

8. Special histology. Digestive system. * Digestive system: structure, functions. Large digestive glands: location and functions. Liver: general structure, characteristic of stroma and parenchyma. Hepatic plates: structure, arrangement in lobules. Liver cells and the liver capillaries - relation between them.

** Hepatocytes: structure, zones and surfaces, bile canaliculi. Stellate macrophages (Kupffer cells). Perisinusoidal space (space of Disse).

*** Fat storing cells (Ito cells) and pit cells: structure, functions, localization.

9. Special histology. Digestive system. * Organs of the digestive system: digestive tube, glands. Large digestive glands: location, functions. Liver: general structure, functions. Intrahepatic and extrahepatic biliary ducts. Canaliculi, Gering canals, interlobular bile ducts.

** Extrahepatic biliary duct and gallbladder: features of mucous membrane. Epithelium.

*** Bile transportation: regulation, gallbladder accumulation, clinical significance.

10. Special histology. Digestive System. * Digestive tube - general structure, parts, layers.

** Esophagus: structure of mucosa, submucosa, muscularis and serosa, glands.

*** Changes in esophagus connected with age. Cardiac glands.

11. Special histology. Digestive System. * Digestive tube – structure, parts, layers.

** Stomach: structure, parts, layers, gastric glands (structure, types, location), comparative characteristics of different parts of stomach wall.

*** The role of stomach during anemia. Parietal exocrinocytes: location, structure.

12. Special histology. Digestive System. * Organs of digestive system: general structure. Large and small glands of digestive system: localization, embryonic origin, functions.

** Small salivary glands: structure and functions.

*** Small salivary glands: innervation, functions.

13. Special histology. Digestive System. * Large salivary glands: structure, localization, embryonic origin, stroma and parenchyma (tissue composition, structure).

** System of excretory ducts: structure, epithelial cells of large salivary glands.

*** Saliva: mechanisms of formation, primary and secondary saliva, role of the intralobular duct system.

14. Special histology. Digestive System. * Large digestive glands: location, functions. Liver: stroma and parenchyma, structure, functions.

** Structural and functional unit of liver, structure.

*** Liver: embryonic development, age-related changes in liver, regeneration.

15. Special histology. Digestive System. * Digestive glands: location, functions. Pancreas – functions, structure, stroma and parenchyma. Acinus: cellular composition, excretory ducts.

** Acinocytes: structure, functions, zones. Centroacinar cells.

*** Acinocytes: regulation of secretory activity. The role of secretin and cholecystokinin in response to food stimulation.

16. Special histology. Digestive System. * Middle region of digestive tube - glands. Large digestive glands. Pancreas: general morpho-functional characteristics, composition of stroma and parenchyma. Functional units of exo- and endocrine component.

** Pancreatic islets: localization, structure, cell types, their hormones and target cells.

*** Relation between the functioning of exocrine and endocrine component of pancreas.

17. Special histology. Digestive System. * Middle digestive region: composition and functional value. Small intestine: segments, structure, layers. Features of small intestine mucosa.

** Morphological features of duodenum, jejunum and ileum.

*** Small intestinal mucosa: blood and lymphatic supply, vascular plexuses in the wall.

18. Special histology. Digestive System. * Digestive tract: compartments, organs of the middle part. Colon: parts, features of structure, layers.

** Colon: folds, cellular composition. Intramural (terminal) ganglia: location, types, functions.

*** Large intestine: digestion of fiber; metabolism of vitamins; excretion of products of metabolism, salts of heavy metals; formation of feces.

19. Special histology. Digestive System. * Digestive glands: types, relation with different departments of digestive tract. Large salivary glands: general structure, stroma and a parenchyma, embryonic development.

** Parotid, submandibular and sublingual glands: types and composition of secretory portions, secretory activity.

*** Intralobular excretory ducts: structure, formation of secretory portions, regulation of saliva composition.

20. Special histology. Digestive System. * Digestive tract: general structure, organs of the anterior compartment. Pharynx: location, parts, structure of layers.

** Lympho-epithelial pharyngeal ring (Waldeyer's ring). Tonsils: general structure, functions. Lymphoid follicles of the tonsils: structure, layers.

*** Crypts of tonsils: structure, cellular composition. Lymphoepithelial interactions in the mucosal immune system.

21. Special histology. Digestive System. * Digestive tract: parts, organs of the anterior part. Esophagus: membranes, functions, glands (localization, histophysiology).

** Esophagogastric junction - features of structure, change in the mucosa.

*** Embryonic development of esophageal membrane.

22. Special histology. Digestive System. * Stomach: regions, layers, cellular composition, structure of gastric mucosa. Determination of gastric rugae and pits.

** Gastric glands: localization, structure, cells.

*** Stomach: histophysiology, composition of gastric juice, chyme formation, innervation.

23. Special histology. Digestive System. * Oral cavity: structure, organs, functions. Features of mucosal structure of mouth.

** Mucosa: types, location. Gingiva and hard palate: structure of epithelium.

*** Tongue - features of innervation. Taste buds: structure, location.

24. Special histology. Digestive System. * Digestive tract: parts, general structure, layers.

** Gastric glands: types, location, structure, functions. Glands of pharynx, esophagus, stomach and intestine. Pancreas and liver - features of structure.

*** Endocrine function of pancreas.

25. Special histology. Digestive System. * Large intestine: departments, general structure, structure of mucosa and muscularis externa in different sections.

** Rectum: portions, morpho-functional features.

*** Rectum: embryogenesis.

26. Special histology. Digestive System. * Small and large intestine: sections, features of structure of mucosa, functions.

** Small intestine: features of structure in different departments. Ileum: structure, Peyer patches. Appendix: features of structure, functions.

*** Mucose-associated lymphoid tissue of digestive tract: location, functions, M-cells.

27. Special histology. Digestive System. * The general plan of structure of a digestive tract: parts, layers. Oral cavity: structure, organs.

** Soft palate: structure of regions, surfaces, features of mucosa.

*** Oral cavity - embryogenesis. Embryogenesis of hard and soft palate, primary and secondary palate.

28. Special histology. Digestive System. * Tooth: general structure. Hard tooth tissues - location. Dentin: features of structure, chemical composition. Odontoblasts: origin, localization, features of structure.

** Intercellular substance and dentin tubules: composition, functions. Types of dentin.

*** Tooth embryogenesis - stages, formation of dental bud and bell stage. Root dentin: features of development.

29. Special histology. Digestive System. * Tooth: anatomical structure, tissue composition. Enamel: chemical composition, structure. Ameloblasts: origin, localization, features of structure. Tomes's process.

** ** Rectum: portions, morpho-functional features.

*** Odontogenesis. Dental buds: structure, embryonic sources of.

30. Special histology. Digestive System. * Tooth: structure, tissue composition. Soft tissues of tooth (periodontal ligament, pulp): composition, functions.

** Pulp: zones, location, features of structure.

*** Tooth: stages of embryonic development. Soft tooth tissues: embryonic development.

31. Special histology. Digestive System. * Tooth: structure, tissue composition. Hard tooth tissues. Cement: localization, chemical composition, features of structure, functions.

** Cement - different types of cement. Relation between periodontium and dentin.

*** Cement: histogenesis of cells. Hertwig's epithelial root sheath: histogenesis of root dentin and cement.

32. Special histology. Digestive System. * Tooth: morpho-functional characteristics, tissue composition, functions.

** Dentin: features of structure, functions.

*** Tooth: stages of embryonic development, histogenesis. Characteristics and sources of development of cells that synthesize enamel, dentin and cement.

33. Special histology. Digestive system. * Digestive system: general morpho-functional characteristics, compartments, layers, functions. Structure of the wall of digestive tract - types of tissues.

** Mucous membrane: structure, layers, gastric pits, mucous membrane in different parts of the digestive system.

*** Sources of development and embryogenesis of the digestive organs.

34. Special histology. Digestive System. * Anterior part of the digestive tube - general characteristics. Walls of the oral cavity: general structure.

** Cheek: layers, areas of mucosa, features of structure of intermediate zone, structure of submucosa,.

*** Facial skeleton: embryonic sources of development, pharyngeal apparatus of embryo, participation in face formation, sources of lips and cheeks formation.

35. Special histology. Digestive System. * Digestive system: general morpho-functional characteristics, compartments, layers, functions.

** Fundus of stomach: features of histological structure, pits, glands, muscular layer.

*** Characteristics and functions of the cellular composition of the pyloric and cardiac glands.

5th questions

1. Special histology. Respiratory system.

* General morpho-functional characteristics

Air passages: structural organization of the bronchial tree, functional significance, general plan of structure (layers, tissues). Lining epithelium: type, cellular composition.

** Regional features of the structure of the wall of bronchi of different caliber (main, large, medium and small diameter) features of the structure of terminal bronchioles. Mucociliary mechanism of clearing of bronchial tree.

*** System of immune defence of respiratory organs. Broncho-associated lymphoid tissue: structural characteristics, functional significance.

2. Special histology. Respiratory system.

* Organs, departments and functions of the respiratory system. The structure of the upper respiratory tract: nasal cavity, nasopharynx, larynx - departments, tissues.

** Features of the structure of the mucous and fibro-muscular and cartilage layers of the nasal cavity, pharynx, larynx and trachea. Glands, lymphoid tissue.

*** Peripheral department of olfactory sensory system, localization and cellular composition of olfactory epithelium, histophysiology of olfactory reception.

3. Special histology. Respiratory system.

* Structural and functional organization of the respiratory system. Departments (portions) and general plan of structure of air passages: tunica, their tissue composition.

** The structural and functional unit of respiratory portion of respiratory system.

Features of structure and histophysiology of respiratory bronchioles.

*** Features of blood supply and nervous apparatus of respiratory system.

4. Special histology. Respiratory system.

* Morpho-functional characteristics, anatomical and functional departments of the respiratory system. Lungs: general plan of the structure, parts, bronchial tree. What is a pulmonary lobule?

** Acinus as a structural and functional unit of the respiratory portion of the lungs.

Alveolus. Surfactant complex. Blood-air barrier. Alveolar macrophages.

*** Sources and stages of respiratory system development.

5. Special histology. Respiratory system.

* The composition of the respiratory system. Respiratory muscles, pleura and pleural cavity.

** The structure of visceral and parietal pleura. Functions of the pleural epithelium

*** Pulmonary interstitium, its structure and significance in the functions of the lungs. Structural changes in the pulmonary stroma and parenchyma at different ages: at birth, at young and old age.

6. Special histology. Urinary system.

* Organs of the urinary system. The general plan for the structure of the kidney: the cortex and medulla, lobes and lobules. The structural and functional unit of the kidney - tissue composition, departments. Types of nephrons.

** Histophysiology of different departments of the nephron and the collecting ducts. Structure of renal corpuscles, tubules of nephron and collecting ducts. How do they participate in urine production?

*** Features of blood circulation in the kidney. Cortical and medullary systems of blood supply. Features of structure and function of juxtamedullary nephrons.

7. Special histology. Urinary system.

* Organs of the urinary system and their importance in the human life. The general plan of structure of organs of urinary systems. Kidney stroma and parenchyma, tissue composition and structurally functional unit.

** Histological structure of the nephron, stages and mechanisms of urine formation, regulation of urine formation.

Filtration, filtration barrier, chemical composition of glomerular filtrate. Tubular reabsorption and secretion.

*** System of concentration and dilution of urine. A countercurrent multiplication system of urine concentration in kidneys. Hormonal regulation of electrolyte reabsorption in distal segments of nephrons.

8. Special histology. Urinary system.

* General plan of structure and significance of organs of urinary system. Histological structure of the structural and functional unit of the kidney, the location of its components in the cortex and medulla. Composition of the medullary rays (Ferrein's) and cortical columns of Bertini. Renal pyramids, lobes and lobules, their histological composition.

** The endocrine apparatus of the kidney.

The juxtaglomerular apparatus, its structure and functions. The prostaglandin and kallikrein-kinin systems of the kidney.

*** Embryonic stages in kidney development. Their time intervals.

Sources and development of pronephros, mesonephros and metanephros.

9. Special histology. Urinary system.

* General morpho-functional characteristics of the organs of the urinary system. Urinary passages. General plan of the structure and tissue composition of the walls of the renal calyces, renal pelvis, ureter, bladder and urethra.

**** Features of structure and functioning of the urothelium of urinary tract.**
Ultramicroscopic structure of superficial urothelial cells - in a relaxed and stretched state.

***** Sources and course of embryonic development of urinary tract.**

10. Special histology. Urinary system.

*** Organs and functions of the urinary system.** The tissue composition of the stroma and parenchyma of the kidney. Departments and general plan for the structure of the structural and functional unit of the kidney. Stages of urine formation in nephrons.

**** Ultrastructure of the renal corpuscle and the epithelium of the nephron tubules in relation with the processes of urination.** Filtration barrier components, the composition of glomerular filtrate.

***** Age-related changes in the kidneys.** Post-embryonic period of kidney maturation, and age-related changes in the kidney during aging.

11. Special histology. Male reproductive system.

*** General morpho-functional characteristics of the organs of the male reproductive system.** Internal and external genitalia.

Testis: localization, tissue composition and functions. Stroma of the testis. The structure of the wall of the seminiferous tubules: the outer connective tissue and the inner spermatogenic layers - their cellular composition. Interstitial cells of Leydig.

**** Spermatogenesis: definition, localization.** Spermatogenous cells, their structure and chromosomal set. Stages of spermatogenesis. Hormonal regulation of spermatogenesis.

***** Histophysiology of the testes at different ages: childhood, puberty, adulthood, aging.**

12. Special histology. Male reproductive system.

*** General characteristics of the structure and function of the male reproductive system.** Intratesticular ducts and excretory genital ducts, their location and general structure.

****Ductuli efferentes and ductus epididymis, their location and features of the structure of the epithelium.** Structure and functional significants of epididymis. Ductus deferens and ejaculatory duct: layers in their walls and tissue composition.

***** Sources of development and embryogenesis of the male excurrent duct system.**

13. Special histology. Male reproductive system.

*** Structure and functions of the male reproductive system.** Organs, their localization in the body and a general plan of structure. Glandular organs of the male reproductive system, their functional significance.

**** The location, origin and structure of the seminal vesicles.** Characteristics of the seminal vesicles secretions, role in the formation of ejaculate.

Prostate gland: location, stroma and parenchyma, zones, prostate glands, their groups, structure and characteristics of the secretion.

Bulbourethral glands: structure features, functional significance.

*** Semen (ejaculate): the structural and chemical composition of semen.
Spermogram - diagnostic value.

14. Special histology. Male reproductive system.

* Organs of the male reproductive system, their location in the body. Functions of the male reproductive system. Microscopic structure of the testis: tissue composition of the stroma and parenchyma. The endocrine function of the male reproductive system, organs and cells that provide it.

** The interstitial cells of the testes. Structure, localization and origin of Leydig cells. Function of interstitial cells, significance of male sex hormones.

*** Hypothalamohypophyseal regulation of spermatogenesis. Features of hormone transport to spermatogenic cells. The blood-testes barrier.

15. Special histology. Male reproductive system.

* The internal organs of the male reproductive system. A tissue composition of the parenchyma and stroma of the testis. Intratesticular tubules and interstitium.

The functional significance of these structures of gonads. General plan for the structure of the wall of seminiferous tubule: connective tissue and spermatogenic layers.

** Cellular composition of spermatogenic epithelium. Structure and significance of supporting cells (Sertoli). Compartments of spermatogenic cells. The blood-testes barrier. Sources of nutrition of cells of basal and adluminal compartments.

*** Indifferent stage of embryonic development of male reproductive system. Embryonic sources of histogenesis of the intratesticular tubes and interstitium of the testis.

16. Special histology. Male reproductive system.

* Structural organization of the male reproductive system. Internal and external male genitalia. The general plan of structure and function of genitals of a man.

** External male genitalia - a general plan for the structure of the copulatory organ.

Tissue composition of corpora cavernosa and corpus spongiosum.

The structure of the male urethra, its parts, layers and types of mucosa epithelium in different departments. General plan of the structure and function of the scrotum.

*** Sources of embryonic development of male external genitalia.

17. Special histology. Female reproductive system.

* General morpho-functional characteristics. Ovary: structure of stroma and parenchyma, functions. Ovarian follicles: types, structural components, folliculogenesis.

** Ovarian cycle: definition, characteristics of ovulation, follicular and luteal phases.

*** Relationship of the female reproductive system with the hypothalamic-pituitary system. Ovarian hormones: targets and biological effects.

18. Special histology. Female reproductive system.

* General organization of the ovary. Structural composition of cortex and medulla. Structure of primordial, primary, secondary and tertiary follicles. Follicular atresia: causes, functional significance of this process.

** The ovarian cycle. Ovulation, definition. The stages of yellow body development, the origin of luteocytes, their structure and function. Effects of progesterone.

*** Hormonal regulation of the ovarian cycle by the hypothalamus.

19. Special histology. Female reproductive system.

* Functions of the female reproductive system. Organs that provide these functions. Ovarian stroma and parenchyma, their functions. Ovarian follicles: types, structural components. Folliculogenesis.

** Phases of oogenesis, their morphological manifestations and spatial-chronological characteristics, connection with folliculogenesis. What is the essence of each phase? Differences oogenesis from spermatogenesis. The structure of the tertiary follicle.

*** Ovarian histophysiology at different ages: before and during puberty, childbearing period, during pregnancy and lactation, menopause.

20. Special histology. Female reproductive system.

* Structure and functions of the female reproductive system. Menstrual cycle, its periods and their essence: menstrual phase, proliferative phase, secretory phase.

** Ovarian hormones, and the structures, that synthesize them. Hormonal relationships of the ovary and menstrual cycles (the effects of ovarian hormones on the menstrual cycle). Hormonal status and morphology of the ovaries and endometrium in different periods of the ovarian and menstrual cycles.

*** Hypothalamo-pituitary regulation of the menstrual cycle.

21. Special histology. Female reproductive system.

* General morpho-functional characteristics of the uterus and fallopian tubes: the structure of the walls, their tissue composition, functions.

** Features of the structure of the fallopian tubes: localization, parts (intramural, isthmus, ampulla and infundibulum), structure of layers, characteristics and cellular composition of the epithelial lining of the mucosa, its participation in the movement of the embryo.

*** Sources of development and embryogenesis of the internal organs of the female reproductive system - oviducts, uterus and vagina.

22. Special histology. Female reproductive system.

* General morpho-functional characteristics of the female reproductive system.

Uterus: functions, structure of wall (layers). Endometrium: layers, tissue composition, features of blood supply to the basal and functional layers. The uterine glands. Myometrium: layers, tissue composition, functions.

**** Menstrual cycle and its phases, relationships with the hormones of hypothalamohypophyseal system and ovaries. Morphological changes that occur in the endometrium during different phases of menstrual cycle, their hormonal regulation, biological significance.**

***** Morphologic and physiologic events in the uterus at different ages: before and during puberty, childbearing period, during pregnancy and lactation, menopause.**

23. Special histology. Female reproductive system.

*** A general plan for the structure of the mammary glands, their stroma and parenchyma.**

**** Microscopic structure of secretory portions and excretory ducts.**

***** Hypothalamohypophyseal regulation of mammary gland functions. Hormones that regulate milk secretion and ejection. Features of the structure of lactating and non-lactating glands.**

24. Special histology. Female reproductive system.

*** Organs and functions of the female reproductive system. A general plan for the structure of the uterus: anatomical parts, layers in the wall, their tissue composition.**

**** Morphological features of the cervix: cervical canal, vaginal part of the cervix, the transformation zone.**

***** Changes in the structure of the uterus (endometrium and myometrium) during pregnancy. The role of chorionic gonadotropin in endometrial hypertrophy.**

25. Special histology. Female reproductive system.

*** Structure and functions of the female reproductive system. The structure of the uterus and fallopian tubes. Structure and significance of the endometrium.**

**** Changes in endometrium during pregnancy. Structure and location of decidua. Types of decidua. The structures they are part of (the maternal part of the placenta, the amnion).**

***** Changes that occur in the endometrium after delivery.**