



МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА ГИСТОЛОГИИ, ЦИТОЛОГИИ И ЭМБРИОЛОГИИ

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ГИСТОЛОГИЯ, ЦИТОЛОГИЯ, ЭМБРИОЛОГИЯ

HISTOLOGY, CYTOLOGY, EMBRYOLOGY

Практикум для студентов медицинского факультета иностранных учащихся



Минск БГМУ 2012

Histology, cytology, embryology. Practical manual for foreign student's faculty (course of studies in English)

Student _____ group_____.

DEMANDS of the HISTOLOGY DEPARTMENT to the STUDENTS:

1. Observe the safety rules in the class rooms of the department (the safety instructions have been carried out), obey internal regulations of Belarusian State Medical University.
2. Do not come late for practical classes, according to the time-schedule.
3. Students are supposed to have medical gowns, albums for studies, color pencils for practical training.
4. Missed classes must be work within 2 weeks after missing classes.
5. Students get a credit and permit to have an exam, if they:
 - have been in all practice lessons;
 - have a positive mark on intermediate control;
 - have done correct all tasks in an album.

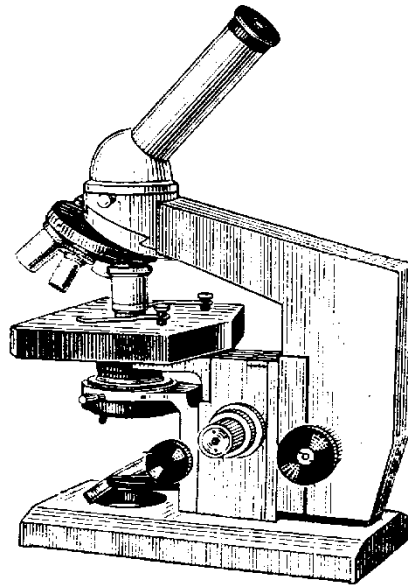
I have read the demands of the department: _____20_____ (signature)

TOPIC: MICROSCOPIC AND HISTOLOGICAL TECHNIQUE. CELL MORPHOLOGY: INTRACELLULAR STRUCTURES	
<ol style="list-style-type: none"> 1. Tasks, objects and methods of modern histology. 2. Methods of histological investigations. 3. Techniques of the histological preparation making 4. The principles and methods of dying histological preparations. Basophylia and oxyphilia (acidophylia) 5. . Definition of a “cell”. Cell derivatives. Cellular theory. 6. Structural organization of cellular synthetic apparatus: ribosomes, polyribosomes, endoplasmic reticulum, Golgi complex. 7. Structural organization of cellular digestion apparatus: endosomes, lysosomes, peroxysomes. 8. Structural elements of cellular energy: mitochondria 9. Cellular inclusions: classifications, structure and functions. 10.Nucleus and its components 11.Cell cycle 	<p>Definition: Histology is</p> <hr/> <hr/> <hr/> <hr/> <p>Definition of a “CELL”</p> <hr/> <hr/> <hr/>

Task 1. BIOLOGICAL MICROSCOPE

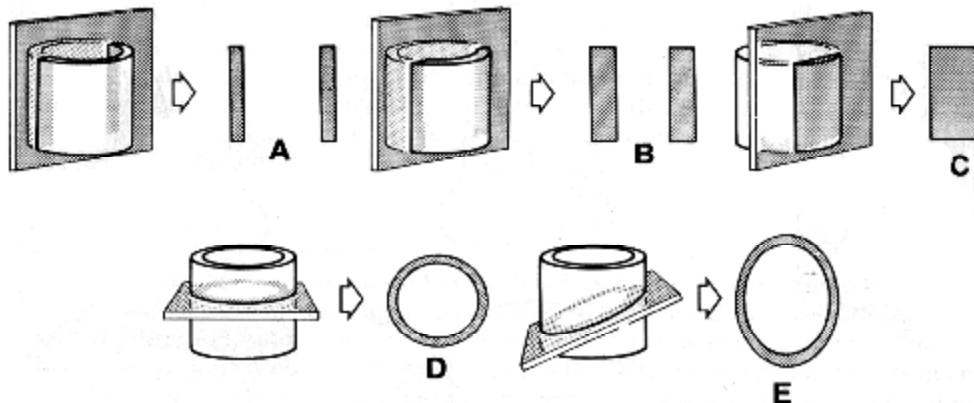
Mark in the picture:

- 1 – stand;
- 2 – drawtube holder;
- 3 – drawtube;
- 4 – objective revolver;
- 5 – object stage;
- 6 – micrometer focusing knob;
- 7 – condenser;
- 8 – ocular;
- 9 – objectives;
- 10 – condenser;
- 11 – mirror;
- 12 – macrometer focusing knob



WHEN WORKING WITH THE MICROSCOPE, REMEMBER TO:

1. Put the preparation on the object stage with the cover glass upwards.
2. At low magnification of the microscope use *the macrometer focusing knob only*
3. Lower the drawtube so that not to damage the preparation.
4. Use the micrometer focusing knob only at high magnification and revolve it no more than 5 points on the scales
5. After the completion of the work at high magnification, first convert the microscope to low magnification and only then take the preparation off the object stage.




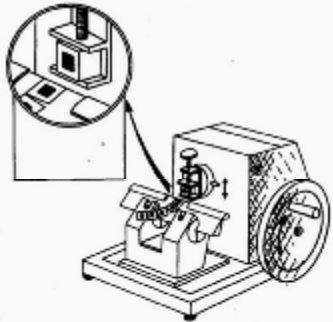
Task 2. SERIES OF DIAGRAMS

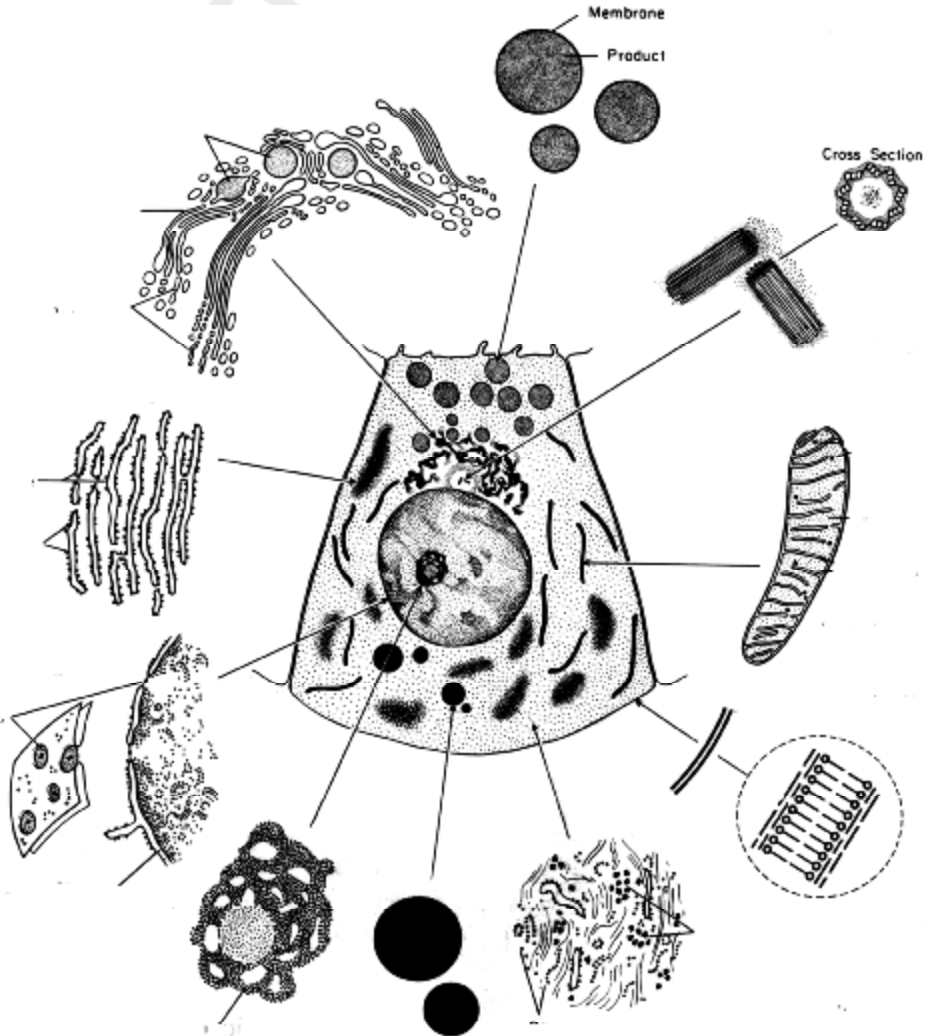
ILLUSTRATING THE APPEARANCE OF SECTIONS OF STRAIGHT TUBE CUT IN VARIOUS PLANES

A,B,C – longitudinal sections cut at different levels relative to the center of lumen. Sections **C** not disclose the presence of a lumen.

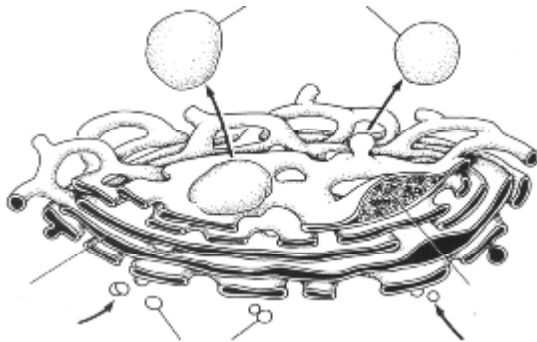
D –transverse or cross section.

E – Oblique sections.

PATTERN OF BASIC STAGES OF MAKING HISTOLOGICAL PREPARATIONS			
To preserve the structural relationship between cells in tissues, it is necessary to cut very thin slise of tissue, called section, that are suitable for light or electron microscopy			
Process	Purpouse	Process	Purpose
1. Taking material	For light microscopy take a sample of 1 x 1 x 0,5 sm, for electron microscopy – 1 x 1	4. Embedding in paraffin Tissue block must be included in suitable medium – paraffin wax or plastic resin 	To obtain thin sections with microtome, tissues must be infiltrated with embedding substance that impart a rigid consistency to the tissue.
2. Fixation A. Chemical: <i>simple fixators</i> ; compound fixators; B. <i>Physical</i> : freezing heating drying microwave treatment	The process of fixation prevents a tissue by denaturing its proteins, preserve the structure and harden soft tissue.	5.Preparation of histological sections with a microtome 	Sections cut for light microscopy must be thin enough to transmit sufficient light, thinner than the diameter of most cells (5-10 µm thin — for transmission light microscopy, 0,05-0,1 µm – for transmission electron microscopy)
3. Dehydration The fixed and rinsed samples are passed through increasing strengths of alcohol (from 70% to100%). The material is kept in each of them from 12 to 24 hours.	The water must be extracted from the samples.	6. Staining, impregnating, contrasting histological preparations	The methods are chosen according to the objective of investigation
		7. Place the section between the cover glass adding a drop of Canadian balm	

<p>STAINING. The stain routinely used for histological sections are the hematoxylin and eosin. Hematoxylin (H) is basic stain, eosin (E) is acid stain. Substances that stain by H are basophilic, E – acidophilic (eosinophilic). The results of staining test: basophile cell structures (nucleus, etc.) obtain a blue or violet coloring after hematoxylin treatment; acidophilic structures (cytoplasm, protein granules) obtain a pink or red coloring after eosine treatment.</p>	<p>Task 3. CELLULAR STRUCTURE Staining Hematoxylin-eosin Magnification 400^x</p> <p>Draw and designate:</p> <ol style="list-style-type: none"> 1 nucleus (basophilic staining); 2 - cytoplasm (oxyphilic staining) 	<p>Task 4. SCHEME OF EUKARIOTIC CELL STRUCTURE</p> 
<p>Designate in the scheme</p> <ol style="list-style-type: none"> 1 cytoplasm membrane; 2 granular cytoplasm reticulum; 3 agranular cytoplasm reticulum; 4 ribosomes; 	<ol style="list-style-type: none"> 5 – mitochondrion; 6 -nucleus; 7 cellular center; 8 -hyaloplasm – 9 nucleoli; 10 -nuclear pores; 	<p>PARTICULATES of CYTOPLASMIC MATRIX</p>

Task 5. DIAGRAM of COMPLEX GOLGI



Designate:

1. cis face;
2. trans face;
3. Golgi saccule;
4. transfer vesicles;
5. secretory granules.

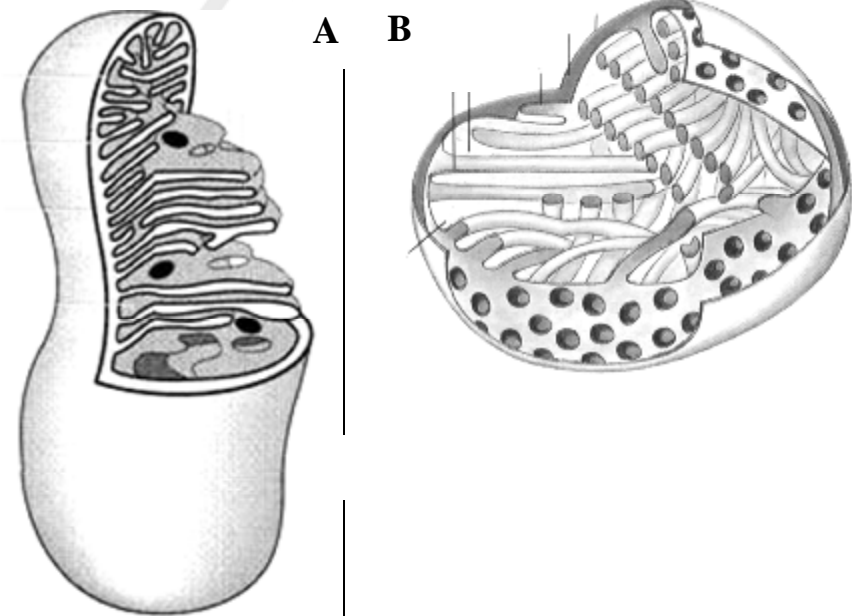
Task 6. GOLGI COMPLEX IN THE SPINAL GANGLION NERVE CELLS

Staining Impregnation with osmic acid
Magnification 400

Draw 1–2 nerve cells and designate:

- 1 – nucleus of neuron;
- 2- cytoplasm;
- 3- Golgi complex.

Task 7. DIAGRAM OF MITOCHONDRIA

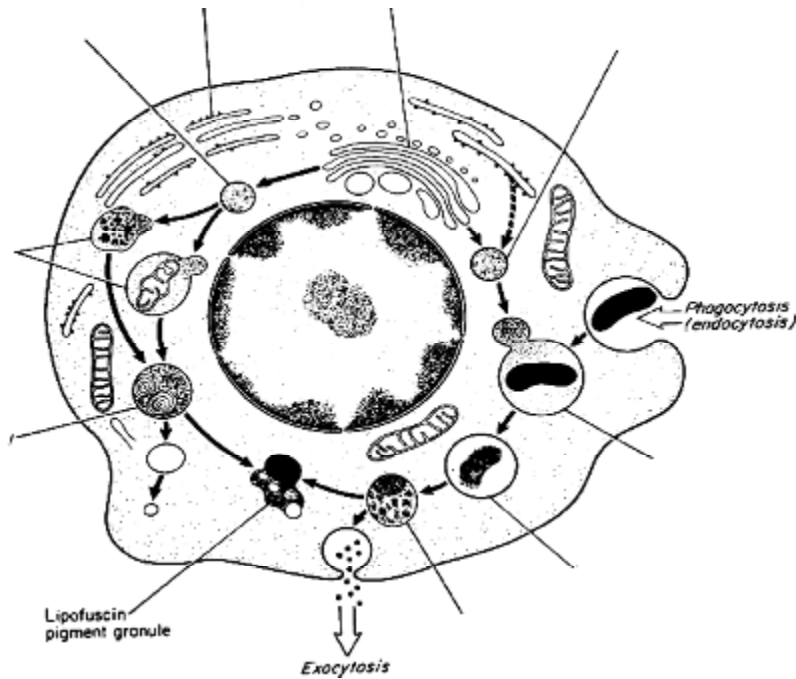


Designate: mitochondria with plate (A) and tubular (B) cristae:

1. outer membrane;
2. inner membrane;
3. cristae;
4. matrix;
5. matrix granule/

Task 9. PROTEIN INCLUSIONS IN EPIDERMIS CELLS

Task 8. LYSOSOMES, PHAGOLYSOSOMES AND MULTIVESICULAR BODIES



Designate: 1 - primary lysosome; 2 – endoplasmic reticulum; complex Golgy; 3 – phagolysosome; 4 – autophagosome; 5 – residual body.

1. Correct tasks _____

2. Teacher

Date «____» _____ .

OF AXOLOTL

Staining: Hematoxilin-eosin

Magnification: 400x

Draw a cell and designate:

1 – cell nucleus; 2 – protein inclusions

Task 10.

Staining Karmin on

Best

Magnification 400^x

GLYCOGEN INCLUSIONS IN HEPATIC CELLS

Draw a cell and designate:

1 – cell nucleus; 2 – glycogen inclusions

Topic: CELL MORPHOLOGY: STRUCTURAL ORGANIZATION OF CELLULAR SURFACE

1. Membrane principle of cell organization. Molecular structure of plasmatic membrane. Basic organization principles of cell membranes.
2. Free cell surface structure: glycocalyx. Submembraneous components of cells.
3. Cell receptors, their classification, structural organization. Ion channels.
4. Types of substance transmission through the plasmalemma: endocytosis, exocytosis
5. Cytoskeleton morphology: microfilaments, microtubules, intermediated filaments
- 6.
7. , The structure of special cell organelles: microvilli and cilia
8. Morphology of cell contact surfaces. Classification and structure of intercellular contacts.

Functions of plasmalemma

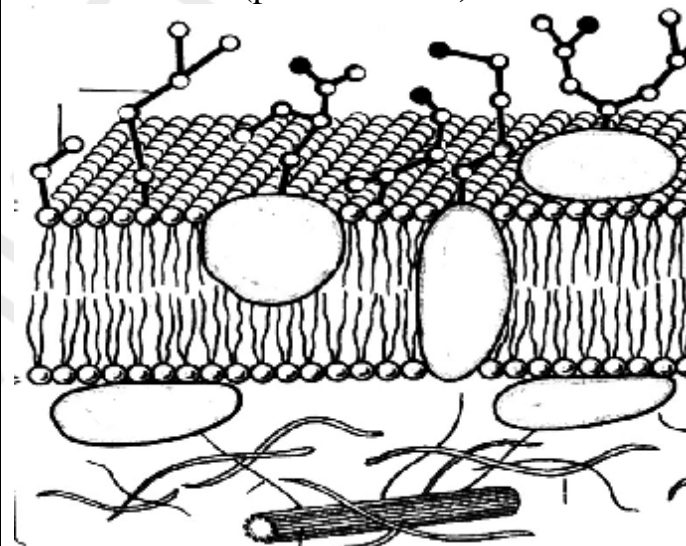
1. _____
2. _____
3. _____
4. _____
5. _____

1. Correct tasks _____

2. Teacher _____

Date « ____ » _____ .

Task 11. SCHEME OF THE STRUCTURAL AND MOLECULAR ORGANIZATION OF PLASMATIC MEMBRANE (plasmalemma)

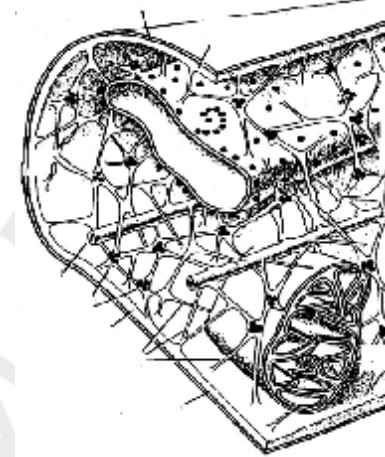
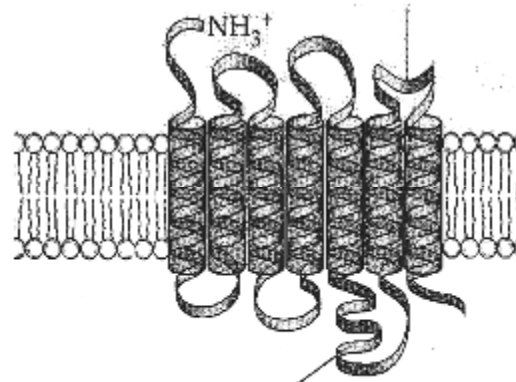
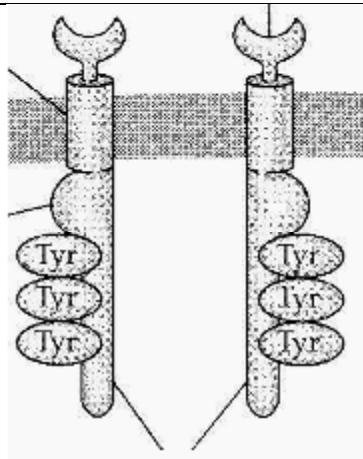


Designate: *I - glycocalyx, II- plasmalemma, III- submembrane complex.*

- 1 – phospholipid bilayer ;
- 2 – membrane proteins : a – receptor protein, b – integral protein, c – submembrane proteins;
- 3 – glycoproteins;
- 4 – glycolipids;
- 5 – actin microfilaments;
- 6 – microtubules.

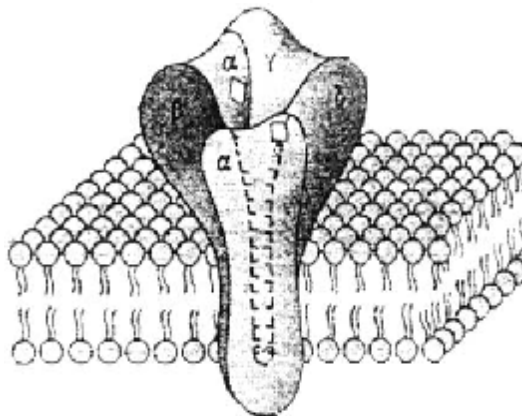
Task 12. PLASMALEMMA RECEPTORS

Task 13. SCHEME OF HYALOPASM TRABECULAR RETICULUM



Designate:

- 1 – mitochondrion;
- 2 – endoplasmic reticular cistern;
- 3 – microtubules;
- 4 – trabecular fibrils;
- 5 – polysomes at the trabecular fibrillar junction;
- 6 – microfilaments;
- 7 – cell membrane



Designate of the scheme:

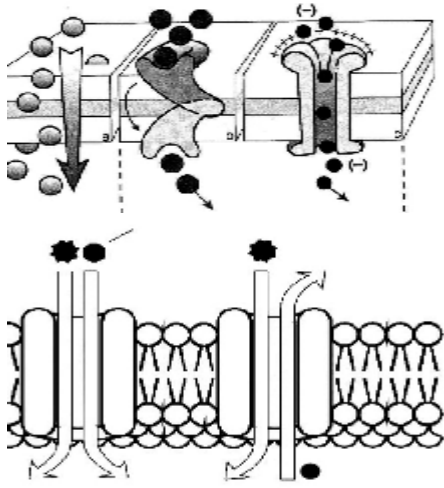
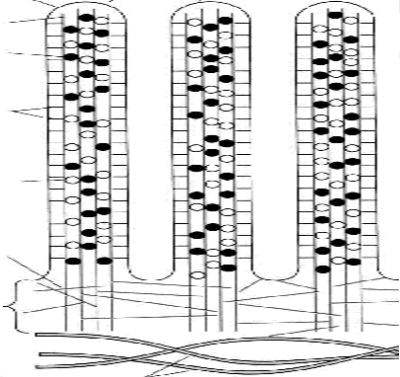
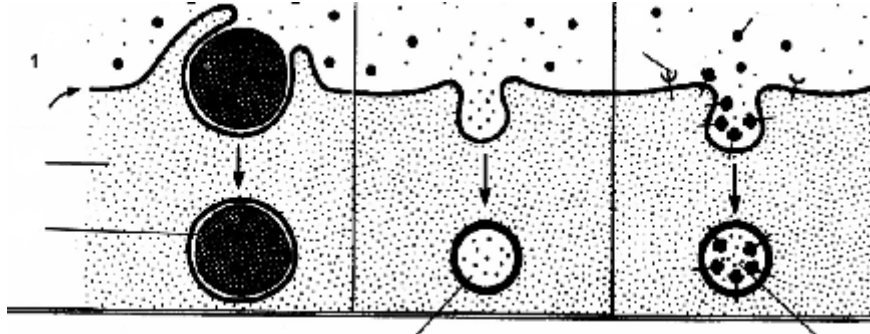
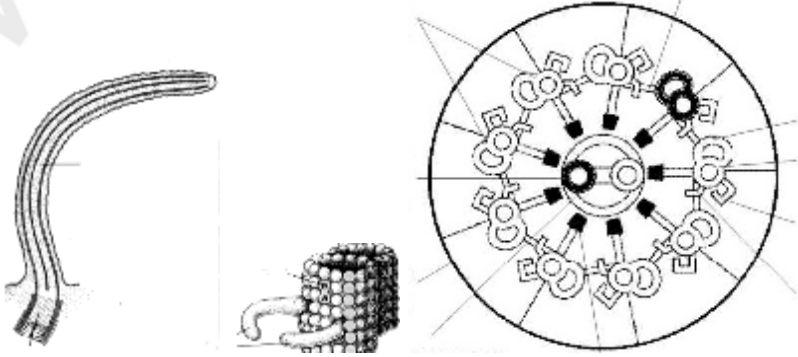
- 1 – 1-segment catalytic tyrosine-kinase receptor ;
- 2 – 7-segment receptor associated with G-protein;
- 3 – acetylcholin canal-forming receptor;
- 4 – extracellular domain;
- 5 – intramembrane domain;
- intracellular domain

Definition of

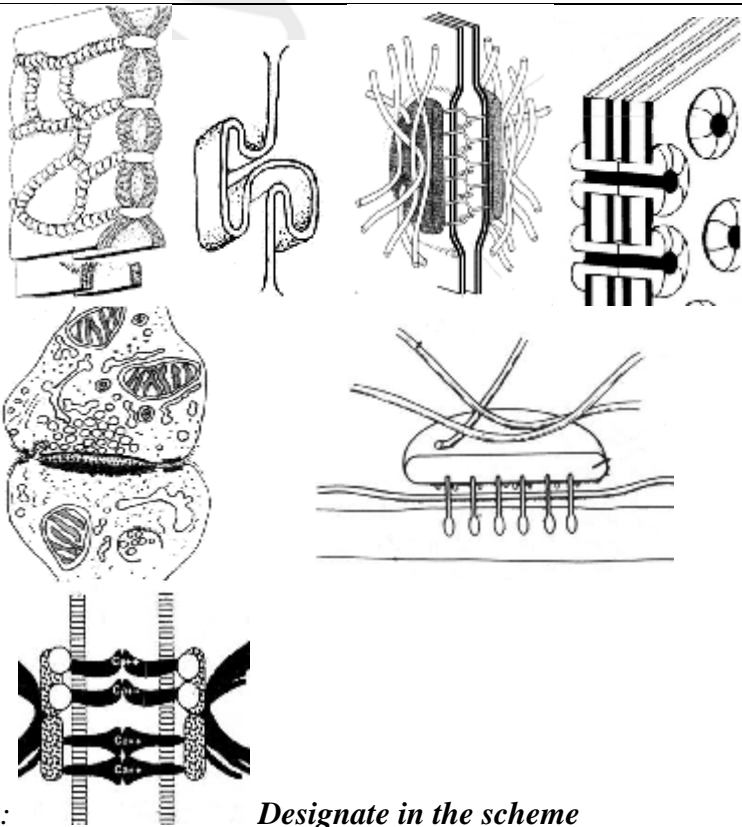
«**Receptor**» _____

Task 14. SCHEME OF TRANSPORT

Task 15. SCHEME OF MICROVILLI AND CILIA MOLECULAR STRUCTURE

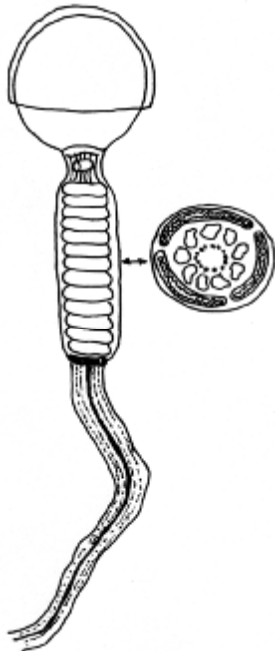

<p>I</p> 		<p>Designate:</p> <ol style="list-style-type: none"> 1 – plasmalemma; 2 – actin filaments; 3 – villin; 4 – calmodulin; 5 – fimbrin; 6 – fodrin; 7 – cytoskeleton terminal reticulum; 8 – intermediate filaments
<p>II</p> 		<p>Designate in the scheme:</p> <p>A –longitudinal B cross section</p> <ol style="list-style-type: none"> 1 – microtubule doublets (A and B 2 – central pair of microtubules; 3 – central membrane; 4 – dineine arms 5 – nexin linking protein; 6 – radial spoke ; - basal corpuscle

Task 16. CLASSIFICATION AND STRUCTURE of CELL JUNCTIONS

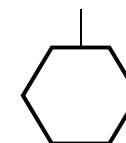
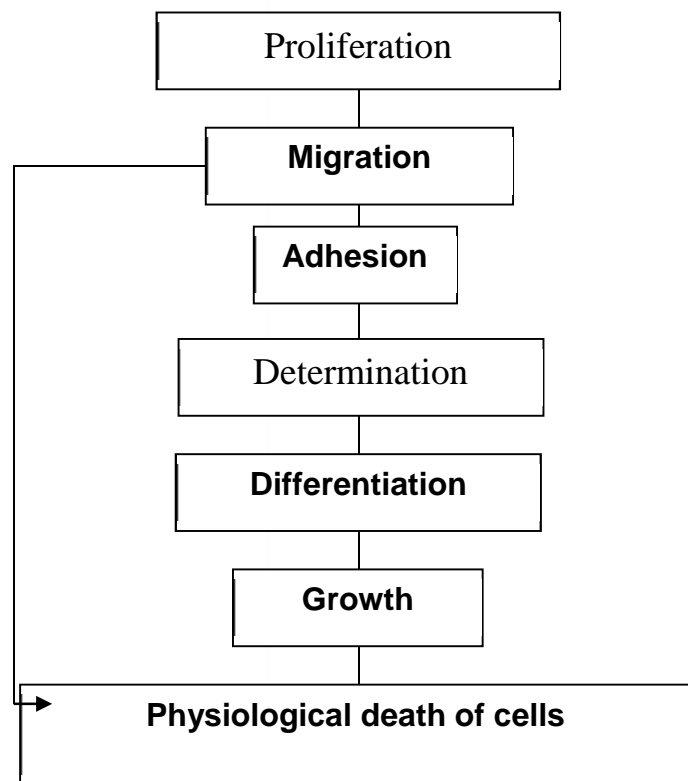
Groups of contacts	Types of contacts	Space between two membrane c	Function	 <p>: <i>Designate in the scheme</i></p> <ol style="list-style-type: none"> 1. zonula occludens; 2. junction denticulate; 3. macula adherens; 4. zonula adherens; 5. nexus; 6. synapses; 7. hemidesmosoma
Occluding junctions Cell –to - cell	Tight junction or zonula occludens	-	Non-permeable for micromolecules and ions	
Adhesive junctions Cell –to - cell	junction simplex junction denticulate zonula adherens desmosome or macula adherens	15-20 nm 15-20 nm 25-30 nm	Mechanical linkage of cells, permeable for micromolecules and ions	
Adhesive junctions Cell –to – extracellular matrix	Focal adhesive hemidesmosome		Anchors the actin cytoskeleton or intermediate filament to the extracellular matrix, transducers signals from outside to the cell	
Communicating junctions Cell –to - cell	Gap junction: Nexus synapses	2-3 nm 20-30 nm	Permeable for ions and substances with M. B.<2000 dalton Transmit of impulses	

Unit III. INTRODUCTION INTO EMBRYOLOGY

Topic:	STAGES OF EMBRYONIC DEVELOPMENT, GAMETES, FERTILIZATION, CLEAVAGE, GASTRULATION		Embryology – fundamental science about developing organisms from fertilization until birth.	
<div>1. Basic periods of ontogenesis of vertebrates.</div> <div>2. Germ cells. Morphological and functional characteristics. Role in transmitting genetic information. Difference from somatic cells. Classification of oocytes.</div> <div>3. Basic periods of embryogenesis of vertebrates. Main processes of embryonic development.</div> <div>4. Fertilization. Definiton, essence, biological significance.</div> <div>5. Cleavage. Definiton. Interconnection between cleavage type and ovum structure. Comparative characteristics of cleavage in different vertebrates. Types and structure of blastulas.</div> <div>6. Gastrulation. Definition. Types of gastrulation.</div> <div>7. Organo- and histogenesis. Definition. Germ layers, their differentiation and derivatives.</div> <div>8. Extraembryonic organs of vertebrates, their functions.</div>			DIFFERENCES BETWEEN GERM CELLS (GAMETES) AND SOMATIC CELLS <div>1. Haploid nucleus</div> <div>2. Oocyte's NCR is 1 : 500 sperm's NCR is 1 : 0.5 somatic cells have NCR 1 : 6</div> <div>3. Depressed metabolism</div> <div>4. Necessity of protection and nutrition</div> <div>5. High specialization.</div>	
<div>Definition of «Cleavage»: _____</div> <div>_____</div> <div>_____</div> <div>Definition of «Gastrulation»: _____</div> <div>_____</div> <div>_____</div>				
Task 17. SPERMATOZOON STRUCTURE	Task 18. SCHEME OF HUMAN SPERMATOZOON	Task 19. OOCYTE STRUCTURE	Task 20. SCHEME OF OOCYTE STRUCTURE	

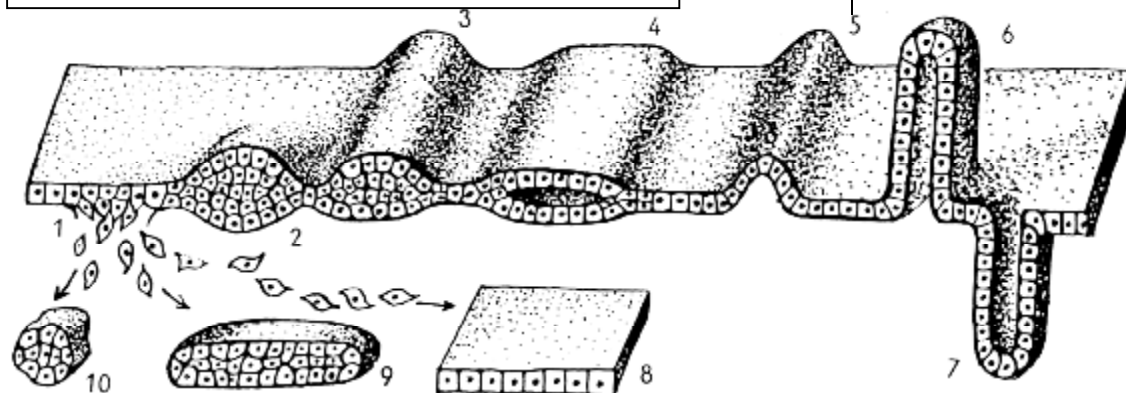
Preparation Staining Magnification	Spermatozoa of the guinea pig Iron hematoxylin 400 ^x	STRUCTURE (under the electron microscope)	Preparation Staining Magnification	Mammal ovum Hematoxylin-eosin 400 ^x	(under the electron microscope)
<p>Draw and designate:</p> <p>A – head: 1 – acrosome; 2 – nucleus;</p> <p>Б – tail; 3 – neck; 4 – middle piece; 5 – principal piece; 6 – end piece.</p>		 <p>Designate:</p> <p>1 – cytoplasmatic membrane; 2 – acrosome; 3 – nucleus; 4 – neck; 5 – mitochondria; 6 – centriole; 7 – circular fibrills.</p>	<p>Draw and designate:</p> <p>1 – nucleus of oocyte; 2 – cytoplasm of oocyte; 3 – oolemma; 4 – zona pellucida; 5 – follicular cells of corona radiata.</p>		 <p>Designate:</p> <p>1 – nucleus; 2 – cytolemma; 3 – cortical granules; 4 – yolk granules; 5 – zona pellucida; 6 – spermatozoon receptors; 7 – follicular epithelium; (corona radiata).</p>



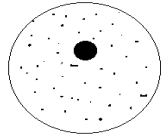
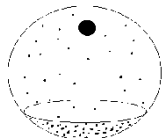
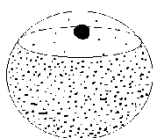
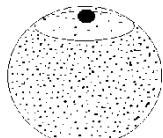
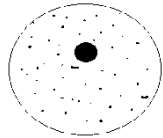
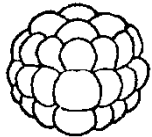

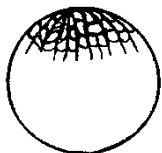
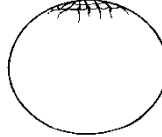
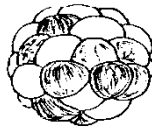
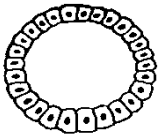
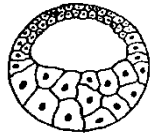
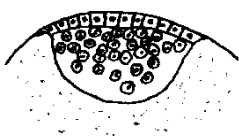
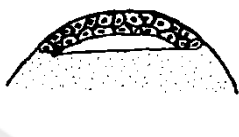
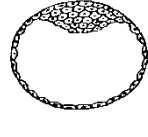
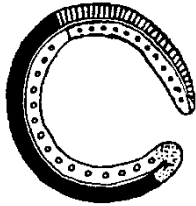
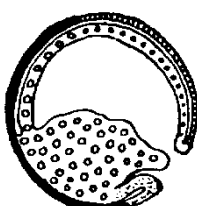
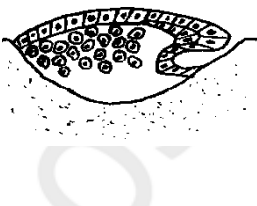
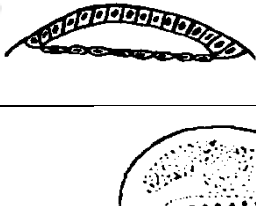
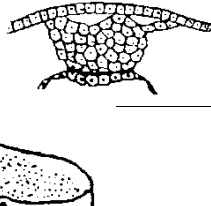


Designate:

A – an example of primordial formation by cell migration;
 B – an example of form formation by cellular layer modification:

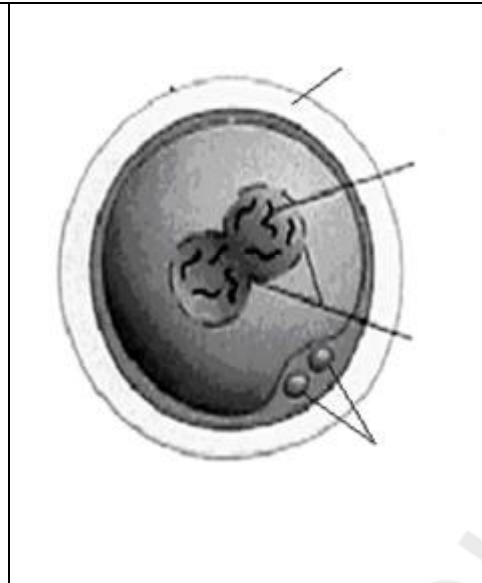
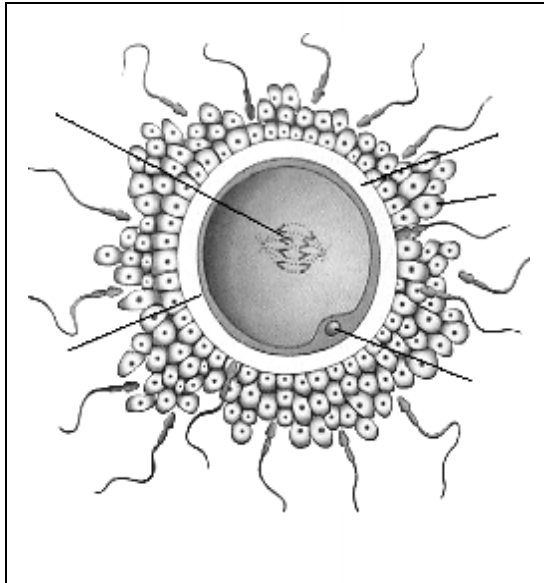


- 1 – migration;
- 2 – local thickening;
- 3 – cellular strip;
- 4 – cellular layer fission;
- 5 – cellular layer curve (fold);
- 6 – bulging with an inner opening;
- 7 – bulging under the layer surface;
- 8 – cellular lamina;
- 9 – cellular trabecula;
- 10 – cellular nodule.

Task 22 Comparative characteristic of vertebrate embryogenesis					
	Incraniates	Amphibia	Fish	Birds	Mammals
Oocyte					
	1.				
	2.				
Cleavage					
	3.				
	4.				
Blastula					
	6.				
Gastrulation					
	7.				

Extraembryonic organs	Neurula			

<p>Topic: EARLY STAGES IF HUMAN EMBRYONIC DEVELOPMENT</p>	<p>Definition of “Differentiation” _____</p>
<ol style="list-style-type: none"> 1. Microscopic and ultramicroscopic structure of human germ cells. Progenesis. 2. Stages of human embryonic development, their duration. 3. Human fertilization. Fertilization stages. 4. Human cleavage. Its essence. Structure of the blastocyst. 5. Human gastrulation. Embryonic disc. Primitive node and primitive streak. 6. Formation of germ layers and axial organs. 7. Differentiation of the germ layers; tissue derivatives. <p>Definition of «Determination» _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<hr/> <hr/> <p>Mechanisms of hystogenesis and organogenesis</p> <ol style="list-style-type: none"> 1. Proliferation, grows and dearth of cells 2. Migration and adhesion of cells 3. Cells interaction 4. Determination 5. Differentiation



Task 23. FERTILIZATION

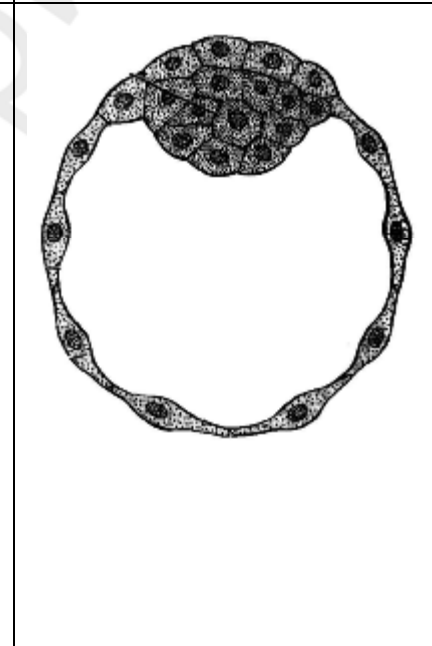
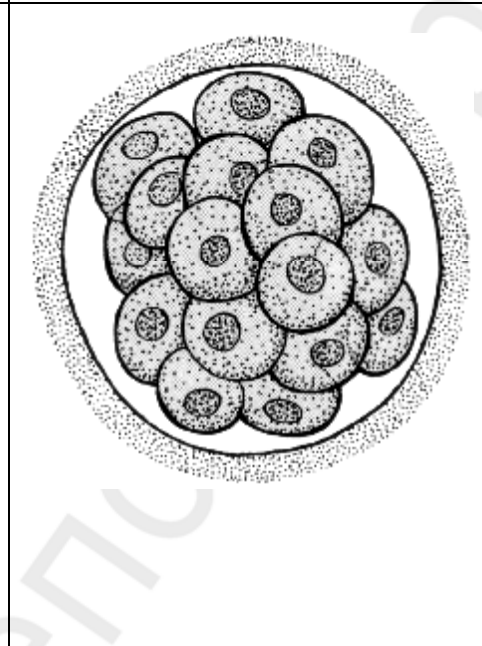
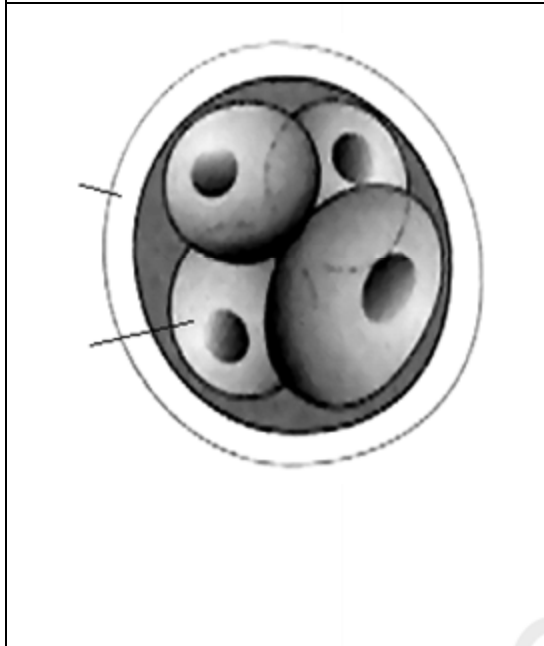
Designate:

- A – contact interaction phase; B – syncarionic phase.
 1 – chromosomes 6 – follicular cells of corona radiata
 2 – oolemma 7 – tunic fertilization
 3 – nuclear membrane
 4 – polar bodies
 5 – zona pellucida

Task 24. CHARACTERISTICS OF CLEAVAGE

based on:

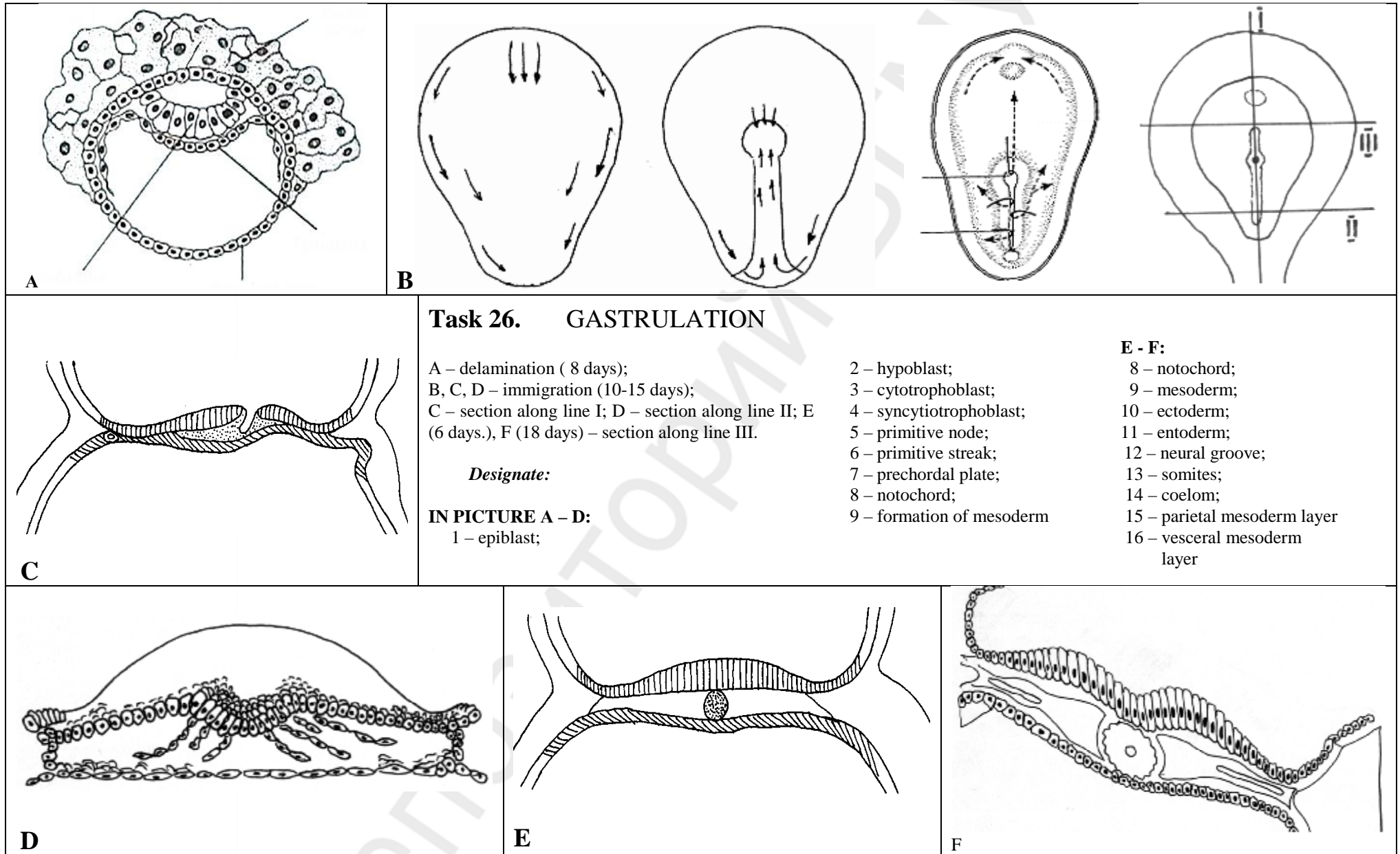
- the coverage of zygote material _____
- the similarity of blastomere size _____
- cleavage synchronization _____



Task 25. CLEAVAGE

Designate:

- A – four-cel stage;
 B – morula;
 C – blastocyst;
 1 – blastomeres;
 2 – tunic fertilization;
 3 – embryoblast;
 4 – trophoblast;
 5 – blastocyst cavity.



Task 27. SOMITES, NOTOCHORD, NERVE TUBE OF CHICKEN'S EMBRYO

Staining Hematoxylin
Magnification 80x, 400x

Designate:

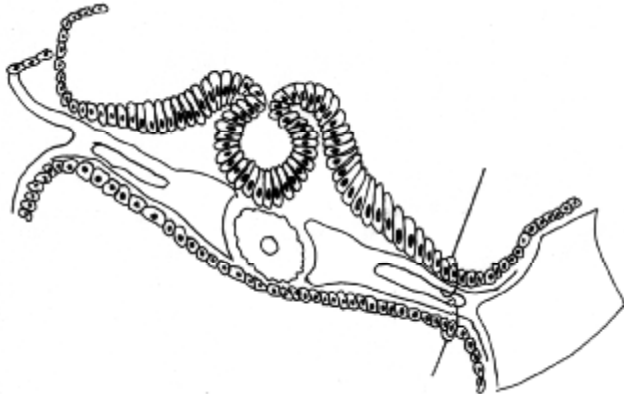
- | | |
|----------------|---------------------------------|
| 1. Nerve tube. | 6. Parietal layer |
| 2. Ectoderm. | 7. Splanchnotome visceral layer |
| 3. Notochord. | 8. Endoderm |
| 4. Somite. | 9. Coelom |
| 5. Nephrotome. | |

Task 28. NEURULATION. EMBRYO FORMATION.

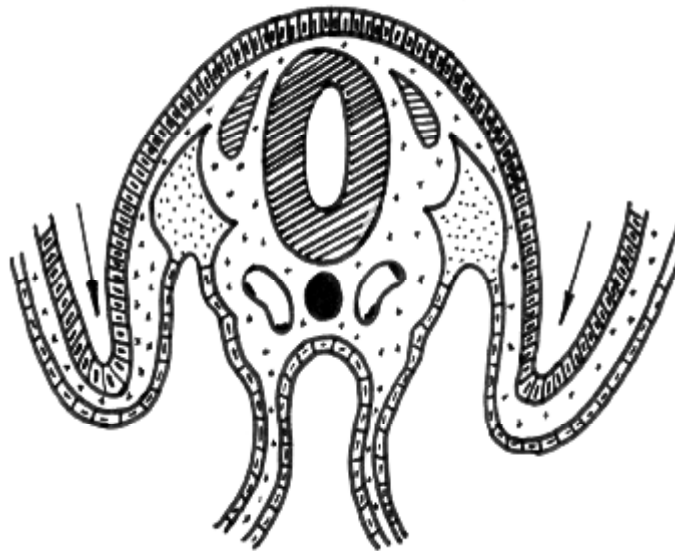
Designate:

- | | | | |
|--------------------|--------------|--|-----------------------|
| 1. Nerve tube. | 3. Notochord | 6. Parietal mesodermal layer (6 a – somatopleure) | 9. Endoderm |
| 2. Spinal ganglia. | 4. Ectoderm | 7. Visceral mesodermal layer (7 a – splanchnopleure) | 10. Forming intestine |
| | 5. Somite | 8. Coelom | 11. Primary vessels |

A



B



A – closure of nerve tube (21st days);
B – formation of embryonic body (22nd-23rd days)

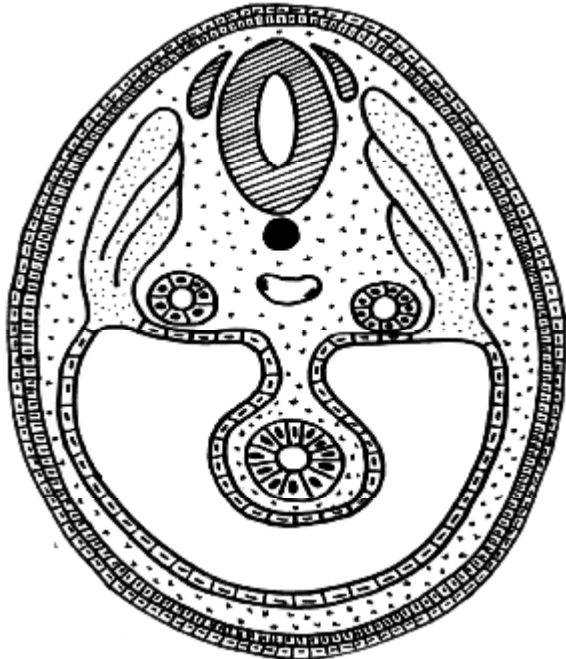
Colour:

Ectoderm – in green;
Endoderm – in red;
Mesoderm and its derivatives – in blue;
Notochord – in brown;
Nerve tube and ganglia – in yellow.

Task 29. CROSS-SECTION OF HUMAN EMBRYO DURING THE 8TH -9TH WEEK OF DEVELOPMENT.

Designate and colour:

1. Nerve tube (in yellow).
2. Spinal ganglia (in yellow)
3. Notochord (in brown)
4. Ectoderm (in green)
5. Somites: a-dermatome; b-myotome;
c-sclerotome (in blue)
6. Parietal mesodermal layer (in blue)
7. Visceral mesodermal layer (in blue)
8. Coelom 9. Mesenchyme
10. Endoderm (in red)
11. Primary vessels



Task 30. DIFFERENTIATION OF EMBRYONIC LAYERS.

Write the names of embryonic layers and their derivatives, learn the origin of different tissue types.

I.		Nervous
II.		Epithelial (stratified)
III.	III A	Epithelial (simple cylindrical)
	III B	Epithelial (simple cuboidal)
	III C	<div>- Skin connective tissue</div> <div>- Skeletal muscular</div> <div>- Skeletal (bone, cartilage)</div>
	III D	<div>Connective</div> <div>Smooth muscular</div>

3. Correct tasks №№ _____

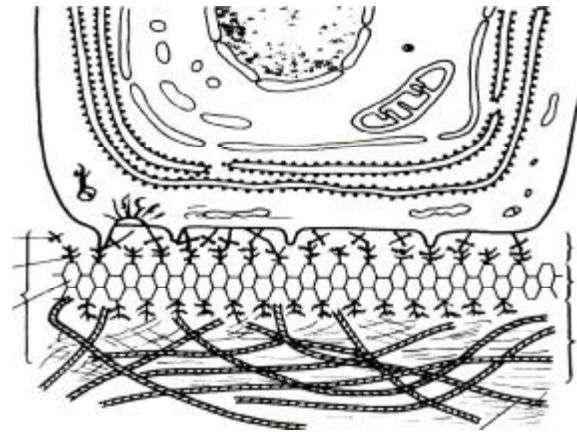
4. Teacher

Date «____» _____ .

Part IV. GENERAL HISTOLOGY

Topic: EPITHELIAL TISSUES	
<p>9. Tissue as one of the levels of live's organization. Definition of the term “tissue”. Classification of tissues, regeneration, changeability and interaction of tissues.</p> <p>10. Morphological, functional and histogenetic properties of epithelial tissues.</p> <p>11. Morphofunctional and histogenetic classifications of epithelia.</p> <p>12. Covering epithelia: structure of different types of epithelia.</p> <p>13. Glandular epithelium: structure and classifications of exocrine glands. Properties of endocrine glands.</p> <p>14. Characteristics of the secretory process. Types of secretion.</p> <p>Definition of the term «Tissue»: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>The basic types of tissues:</p> <p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>The main property of the every type of tissue:</p> <p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p>

Task 31. **CHEME OF
MOLECULAR
ORGANIZATION OF
BASAL MEMBRANE**



Designate:

- 1 – lamina lucida;
- 2 – lamina densa;
- 3 – reticular lamina;
- 4 – collagen fibrils;
- 5 – laminin;
- 6 – proteoglycan;
- 7 – type IY collagen.

Task 32. **SIMPLE SQUAMOUS
EPITHELIUM
(MESOTHELIUM)**

Staining Impregnation with
nitrogenous acidic silver-
hematoxylin

Magnification 400^X



B.

Designate:

A – cross-section of mesothelium:

1 – basal membrane;

Draw and designate:

B – portion of total preparation:

- 2 – cell borders;
- 3 – cytoplasm;
- 4 – nuclei;
- 5 – stomatas.

Task 33. **SIMPLE CUBOIDAL
EPITHELIUM OF
RENAL TUBULES**

Hematoxylin-eosin
400^X

Staining
Magnification



B.

A – simple cuboidal epithelium;

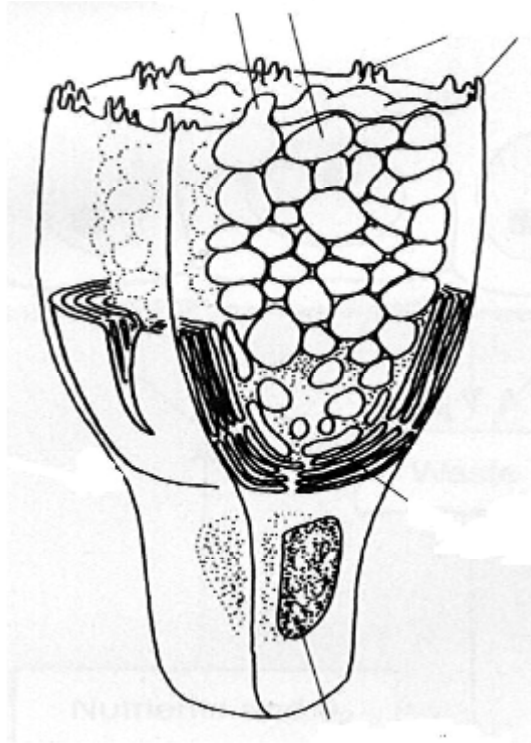
Draw and designate:

B – renal tubule:

- 1 – cell borders;
- 2 – nuclei;
- 3 – cytoplasm;
- 4 – basal membrane.

Task 34.

**STRUCTURE OF
ENTEROCYTE**



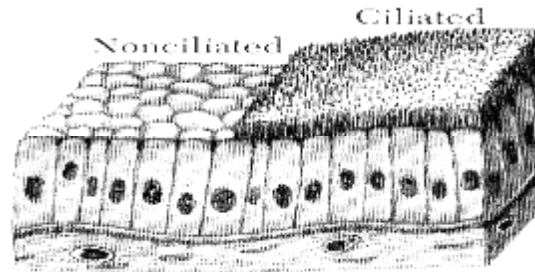
Designate:

- 1 – basal part of cell;
- 2 – apical part of cell;
- 3 – nucleu
- 4 – microvilli;
- 5 – secretory vesicles;
- 6 – Golgi apparatus;

Task 35.

**SIMPLE
COLUMNAR
INTESTINAL
EPITHELIUM**
Hematoxylin-eosin
400^x

Staining
Magnification



A.

B

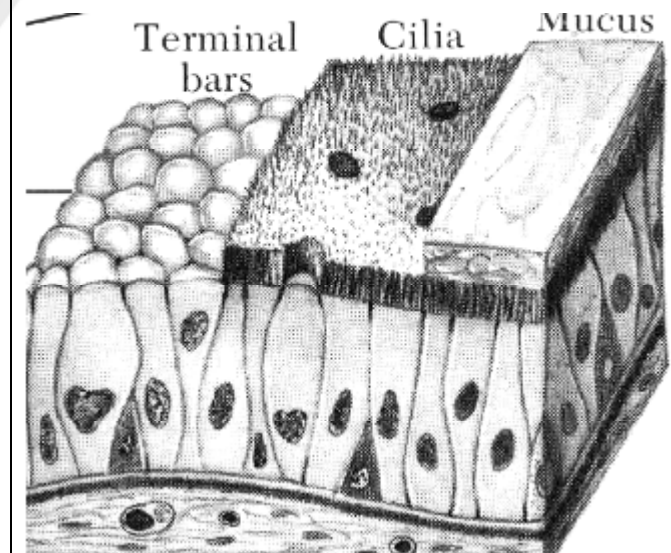
**Draw intestinal epithelium and designate in
scheme (A) and picture (B):**

- 1 – microvilli (border);
- 2 – columnar cells;
- 3 – basal membrane.

Task 36.

**PSEUDOSTRATIFIED
CILATED
EPITHELIUM OF
TRACHEA**
Hematoxylin-eosin
400^x

Staining
Magnification



Designate:

- 1 – ciliated cells;
- 2 – cilia;
- 3 – interca
- 4 – goblet cells;
- 5 – basal membrane.

Task 37. STRATIFIED SQUAMOUS
NONKERATINIZED EPITHELIUM OF
EYE CORNEA

Staining: Hematoxylin-eosin
Magnification 400^x

Designate:

- 1 – basal membrane;
- 2 – basal layer;
- 3 – intermediate layer;
- 4 – flattened surface layer;
- 5 – germinal layer.

Task 38. STRATIFIED SQUAMOUS
KERATINIZED EPITHELIUM OF
FINGER'S SKIN

Staining: Hematoxylin-eosin
Magnification 80^x

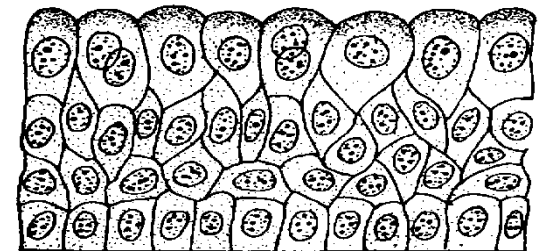
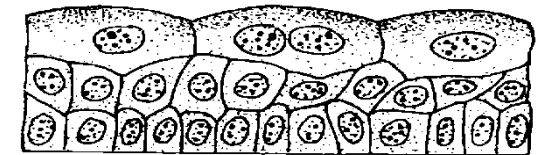


Designate:

- 1 – basal membrane;
- 2 – stratum basale;
- 3 – stratum spinosum;
- 4 – stratum granulosum;
- 5 – stratum lucidum;
- 6 – stratum corneum;
- 7 – granules in the cells of stratum granulosum.

Task 39. STRATIFIED
TRANSITIONAL EPITHELIUM OF
URINARY BLADDER

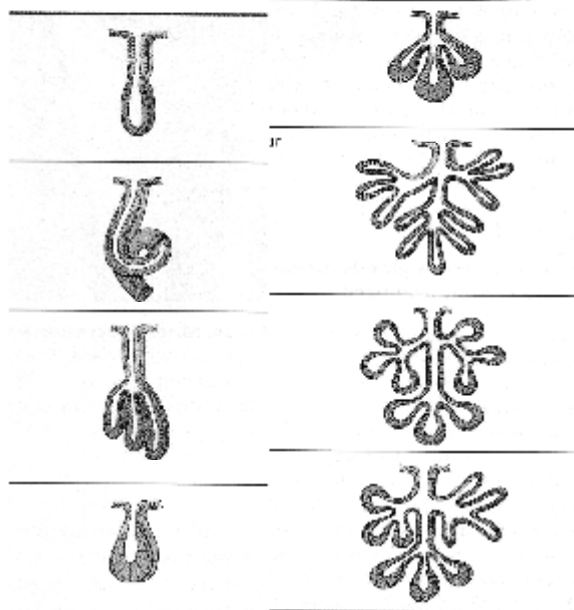
Staining: Hematoxylin-eosin
Magnification 400^x



Designate:

- A – epithelium in the stretched state;
- B – epithelium in the non-distended state:
- 1 – basal membrane;
- 2 – basal cells;
- 3 – intermediate cells;
- 4 – surface cells.

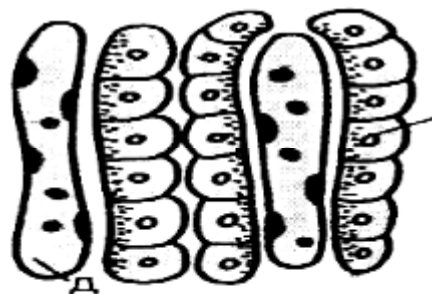
Task 40. GIVE FULL NAMES OF THE EXOCRINE GLANDS



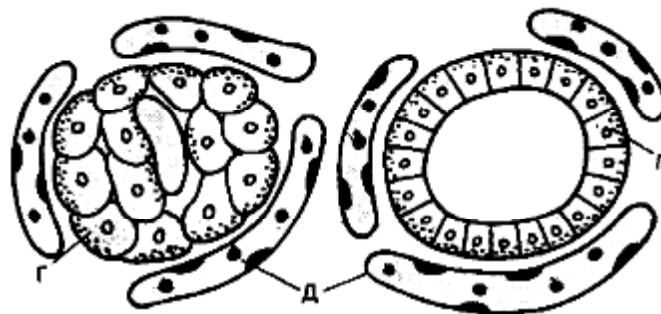
1.
2.
3.
4.

5.
6.
7.
8.

Task 41. CALL MORPHOLOGICAL TYPES OF THE ENDOCRINE GLANDS



A

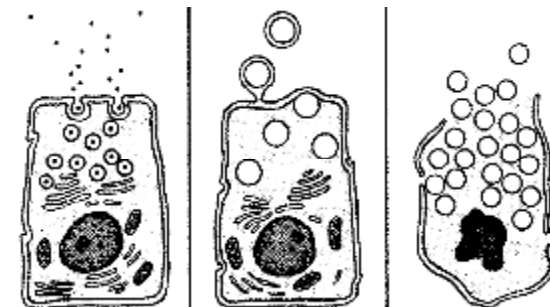


B

Designate:

1 – secretory cells,
2 – capillaries

Task 42. DESIGNATE THE TYPE OF SECRETION



1 – Merocrine

2 – Apocrine

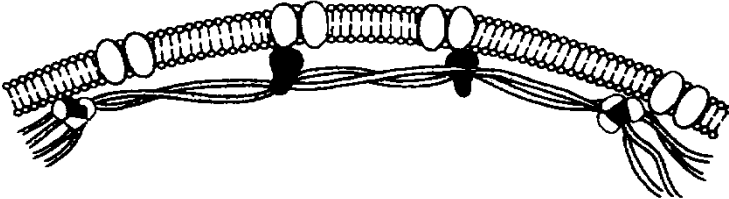
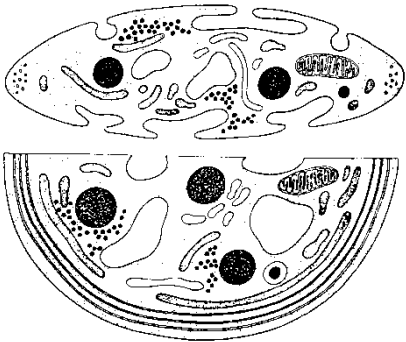
3 – Holocrine

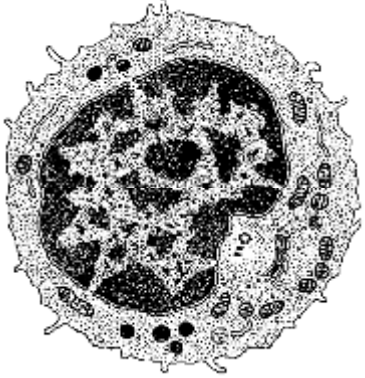
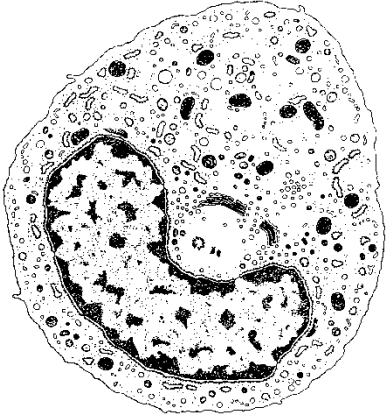
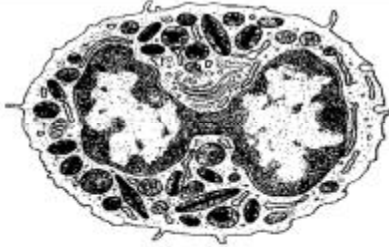
Correct tasks №№ _____

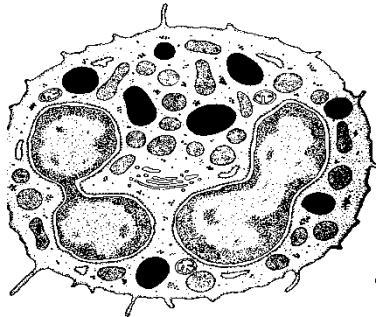
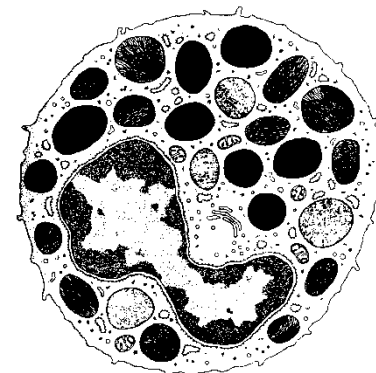
Teacher

Date « ____ » ____ .

Topic: BLOOD AND LYMPH		
<p>1. Blood and lymph as types of inner tissues. 2. Functions of blood and lymph. 3. General morphology of blood. Corpuscular elements of blood, their classification. 4. Erythrocytes: shape, size, structural peculiarities, function, duration of life. 5. Leucocytes: classification, shape, size, structure, function, duration of life. 6. Thrombocytes: shape, size, structure, function, duration of life. 7. Hemogramme. Hematocrit. Leucocytic formula, shift of blood formula to the left.</p> <p>12. Functions of blood:</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>4. _____</p> <p>5. _____</p> <p>6. _____</p>	HEMATOGRAMMES	
	Findings	Value
	Hematocrit Hemoglobin Erythrocytes Reticulocytes Leucocytes Thrombocytes ESR	0,35-0,55 120-140 g/l F - $3,9-4,9 \times 10^{12} / l$ M - $4,7-5,2 \times 10^{12} / l$ 0,6-0,8% $3,8-9,8 \times 10^9 / l$ $200-400 \times 10^9 / l$ 3-8 mm/h
	Leucocytic formula (%)	
	Neutrophils Among them:	Altogether 65-70 Y-ng. band-n. Segm-n 0-1 1-4 60-70
	Eosinophils Basophils Lymphocytes Monocytes	1-5 0-1 20-40 6-8

Task 43. Staining Magnification	CELLS OF HUMAN BLOOD Hematoxylin-eosin 400 ^x			
Blood cells		Size, functions	MEMBRANE AND CYTOSKELETON OF ERYTHROCYTE	
Erythrocyte			Designate: 1 – Basic transmembraneous protein; 2 – spectrin; 3 – actin; 4 – stabilizing protein; 5 – ankyrin. 	
Thrombocyte (blood platelet)		Designate: 1 – granules; 2 – glycogen; 3 – border membraneous tubules; 4 – circular bands of microtubules; 5 – tubules of dense tubular reticulum; mitochondria	Thrombocytes in blood smear	Size and function

Lymphocyte (agranulocyte)		Designate: 1 – nucleus; 2 – lysosomes; 3 – ribosomes; microvilli.	Lymphocyte in smear	Size, function
Monocyte (agranulocyte)		Designate: 1 – nucleus; 2 – lysosomes; 3 – vacuoles; 4 centrioles.	Monocyte in smear	Size, function
Eosinophil (granulocyte)		Designate: 1 – nucleus; 2 – specific granules; 3 – crystalloid; 4 – pseudopodia. Granules contain: 1. 2. 3. 4.	Eosinophil in smear	Size, functions

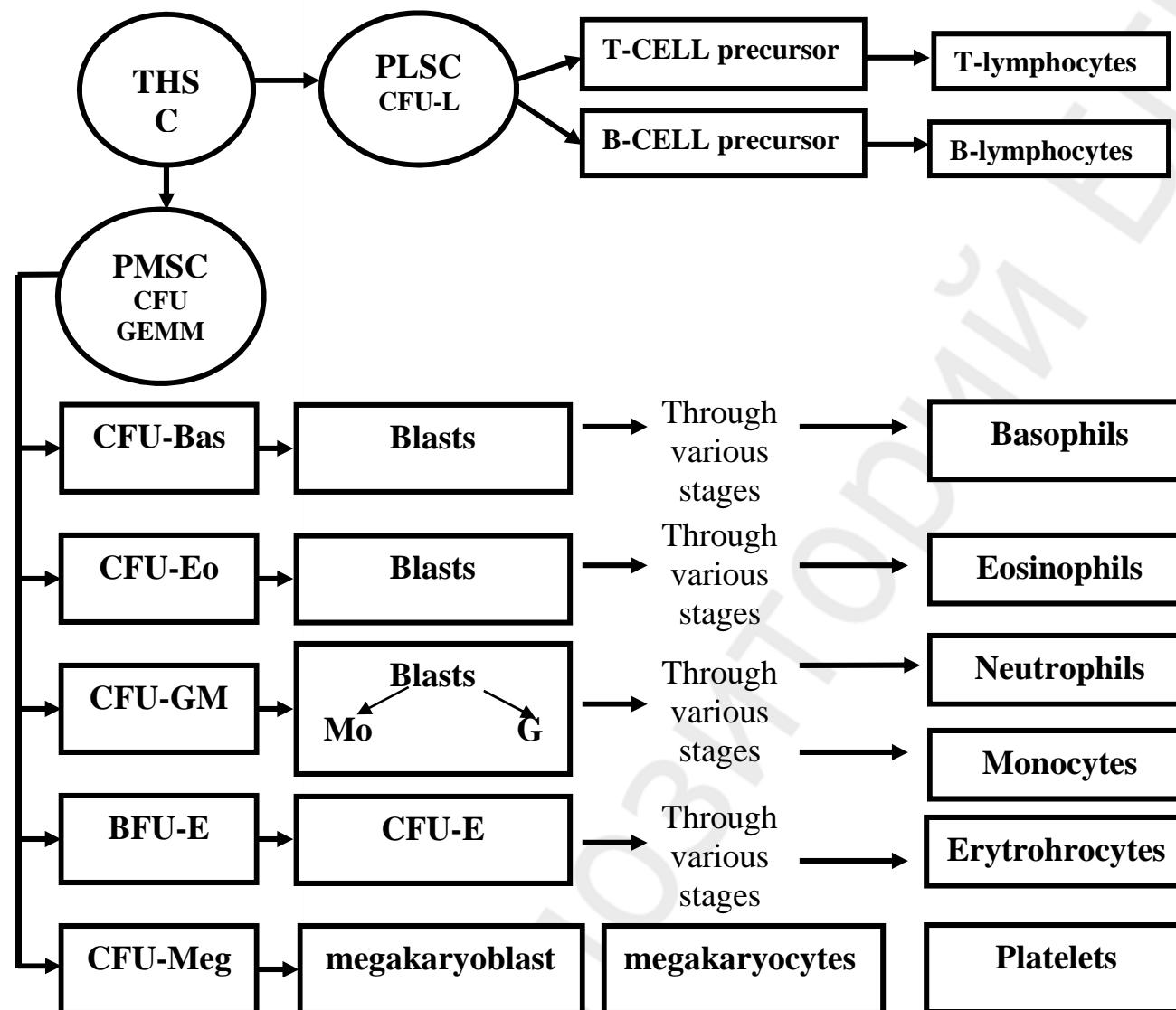
Neutrophil		Designate: 1 – nucleus; 2 – specific granules; 3 – azurophilic granules; 4 – glycogen; 5 – pseudopodia. <i>Specific granules contain:</i> 1. 2. 3.	Neutrophils in smear: a - young; b - band; c - segmented	Size, function
Basophil		Designate: 1 – nucleus; 2 – specific granules. <i>Specific granules contain:</i> 1. 2. 3. 4. 5.	Basophil in smear	Size, functions

Correct tasks №№ _____

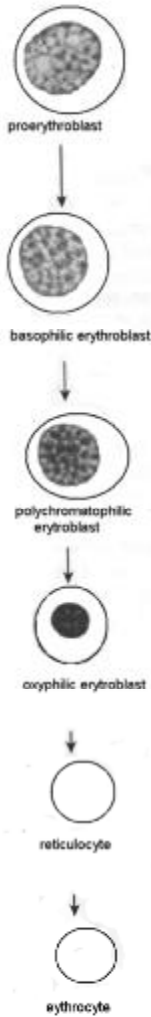
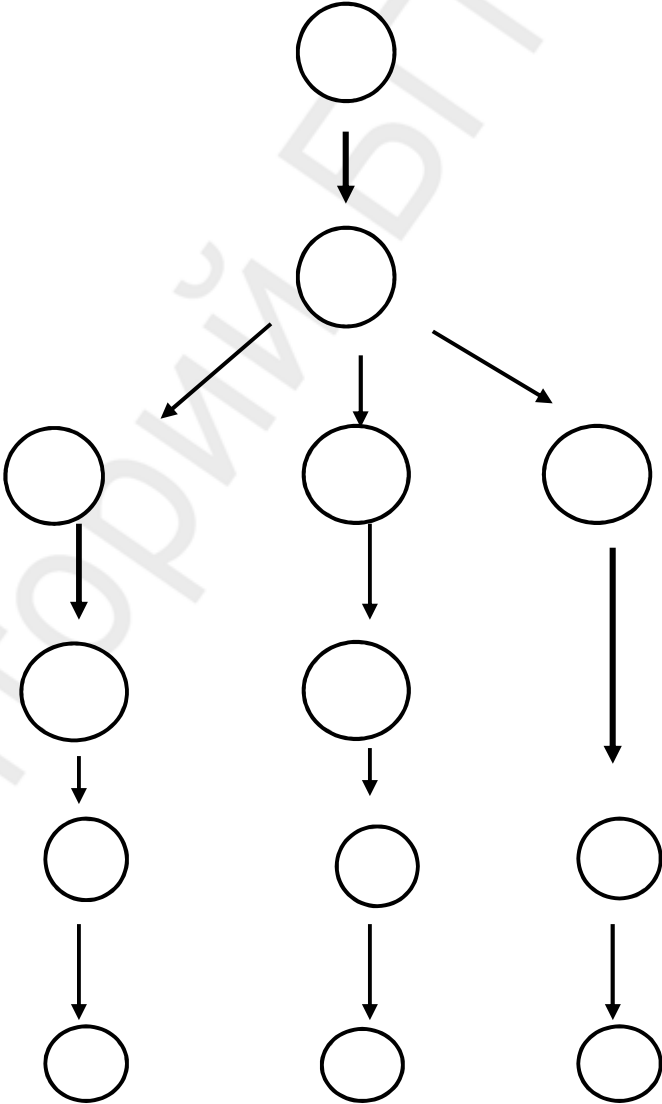
Teacher _____

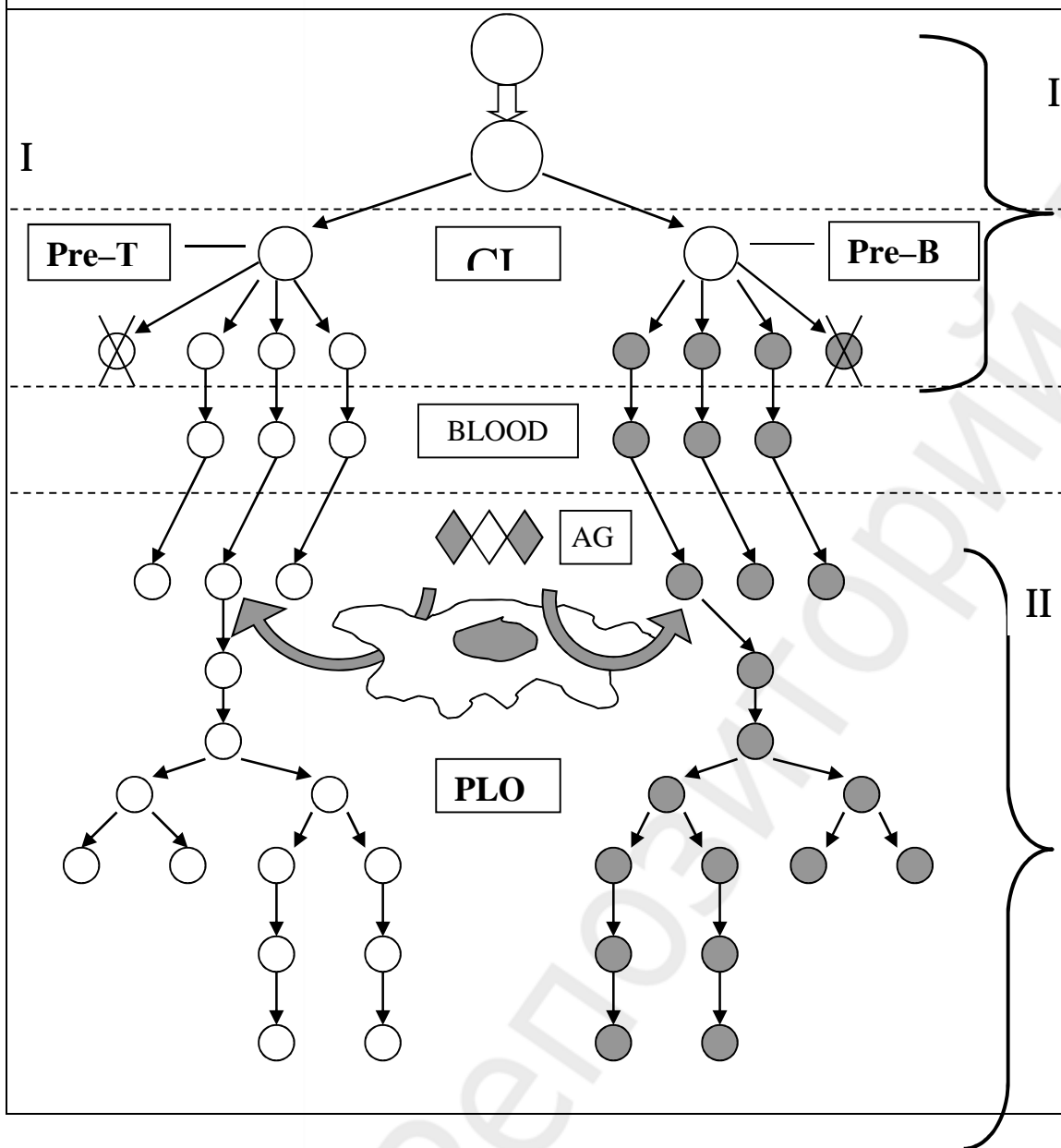
Date « ____ » _____ .

Task 45 SCHEME of HAEMOPOIESIS



- I class** – totipotent haemal stem cell – THSC
- II class** – pleuropotent stem cell – PLSC -pleuropotent lymphoid SC
PMSC – pleuropotent myeloid SC
- III class** - CFU –Bas – colony-forming units basophils
CFU –Eo –colony forming units eosinophils
CFU –GM colony-forming units neutrophils , monocytes
BFU-E burst –forming units erythrocytes
CFU –Meg colony-forming units megakaryocytes
- IV class** - blasts
- V class** – immature cells
- V1 class** - mature cells

TASK 46	SCHEME OF ERYTHROPOIESIS	TASK 47	SCHEME OF GRANULOPOIESIS
 <p>proerythroblast</p> <p>basophilic erythroblast</p> <p>polychromatophilic erythroblast</p> <p>oxyphilic erythroblast</p> <p>reticulocyte</p> <p>erythrocyte</p>	<p><i>Draw cytoplasm in color and designate</i></p> <ol style="list-style-type: none"> 1. differential cells; 2. maturational cells 3. mature cell <p><i>Write the main characteristic of erythropoiesis</i></p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 		<p><i>DRAW THE CELL AND WRITE THEIR NAME:</i></p> <p>I. BLAST CELL – MYELOBLAST;</p> <p>II. differential cells -</p> <ol style="list-style-type: none"> 1. promyelocytes, 2. myelocytes; <p>III. maturational cells -</p> <ol style="list-style-type: none"> 3. methamyelocytes, 4. band cells; <p>IV. mature cell -</p> <ol style="list-style-type: none"> 5. neutrophil, 6. eosinophil, 7. basophil,



I - antigen independent differentiation

II - antigen dependent differentiation

AG – antigens

Pre-T – precursory T-lymphocyte cells

Pre-B – precursory B-lymphocyte cells

CLO – central lymphoid organs

PLO – peripheral lymphoid organs

Designate:

1 – stem hemapoietic cell;

2 – hemi-stem hemapoietic cell;

3 – antigens;

4 – macrophage;

5 – T-lymphocytes;

6 – B- lymphocytes;

7 – memory cells;

8 – effector T-lymphocytes;

9 – plasmatic cells;

10 - banned clones of lymphocytes

5. Correct tasks №№ _____

6. Teacher

Date «____» _____ .

Topic: FORMATION OF blood cells (HEMOPOIESIS)

- 13.1. Modern theory of hemapoiesis. Stem hemapoietic cell. Differones and hemopoietines.
 14.2. Embryonic hemapoiesis in the yolk sac, liver, thymus, spleen, lymph nodes, red bone marrow.
 15.3. Erythropoiesis.
 16.4. Granulopoiesis.
 17.5. Monocytopoiesis. Mononuclear phagocytic system.
 18.6. Lymphopoiesis (antigen independent) in central lymphoid organs. T- and B-lymphocyte systems. Cellular and humoral immunity.
 19.7. Lymphopoiesis in peripheric lymphoid organs, its dependence on antigen activity.
 20.8. Cell cooperative interactions in immune response.

CENTRAL HEMOPOIETIC ORGANS

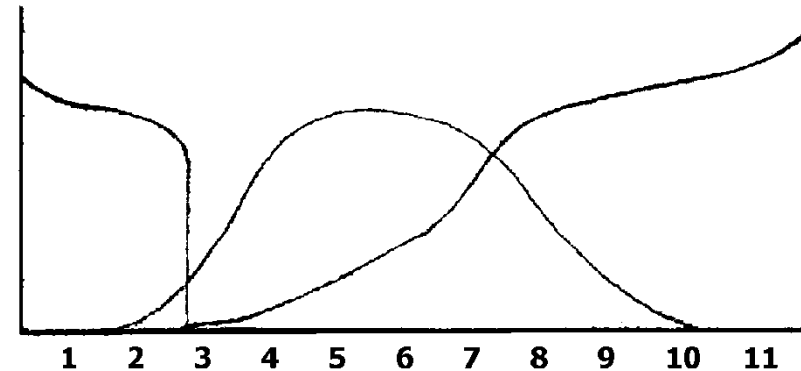
25. Name of organ	Corpuscular elements formed	
	In embryonic period	After burth
26. Red bone marrow	29.	30.
27.		
28. Thymus		

PERIPHERY HEMAPOIETIC ORGANS

Name of organ	Corpuscular elements formed	
	In embryonic heriod	After burth
Spleen		
Lymph nodes		
Tonsils		
Appendix		
Solitary nodules		

Task 44. DEVELOPMENT STAGES OF HEMOPOIESIS IN HUMAN BEINGS

21.



22.

Age of the fetus (in terms of months)

Color different periods of hemopoiesis:

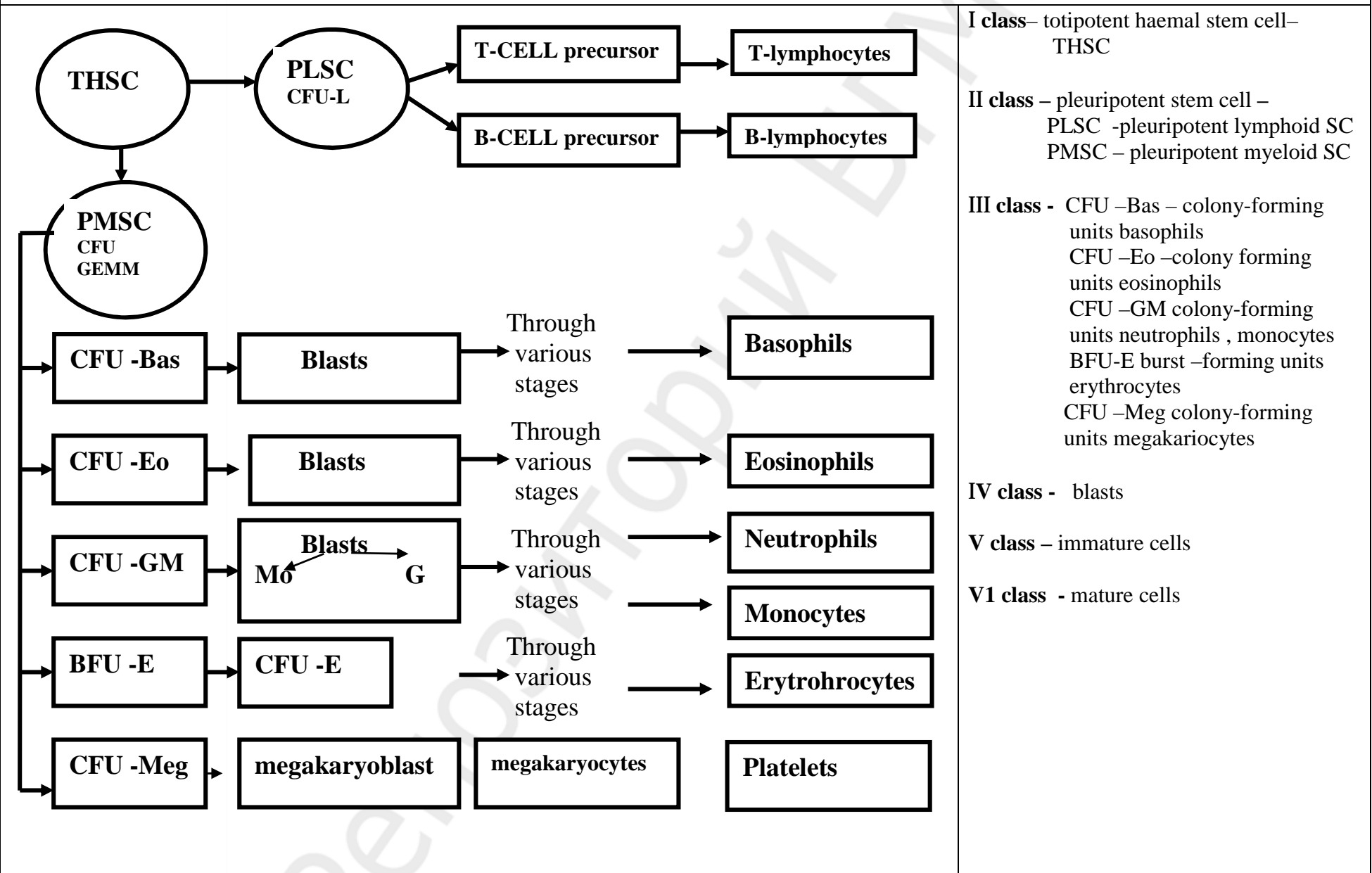
mesoblastic period – **in yellow**;

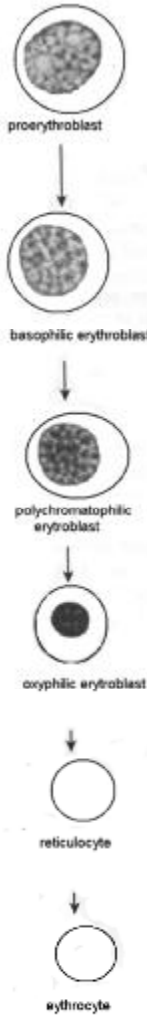
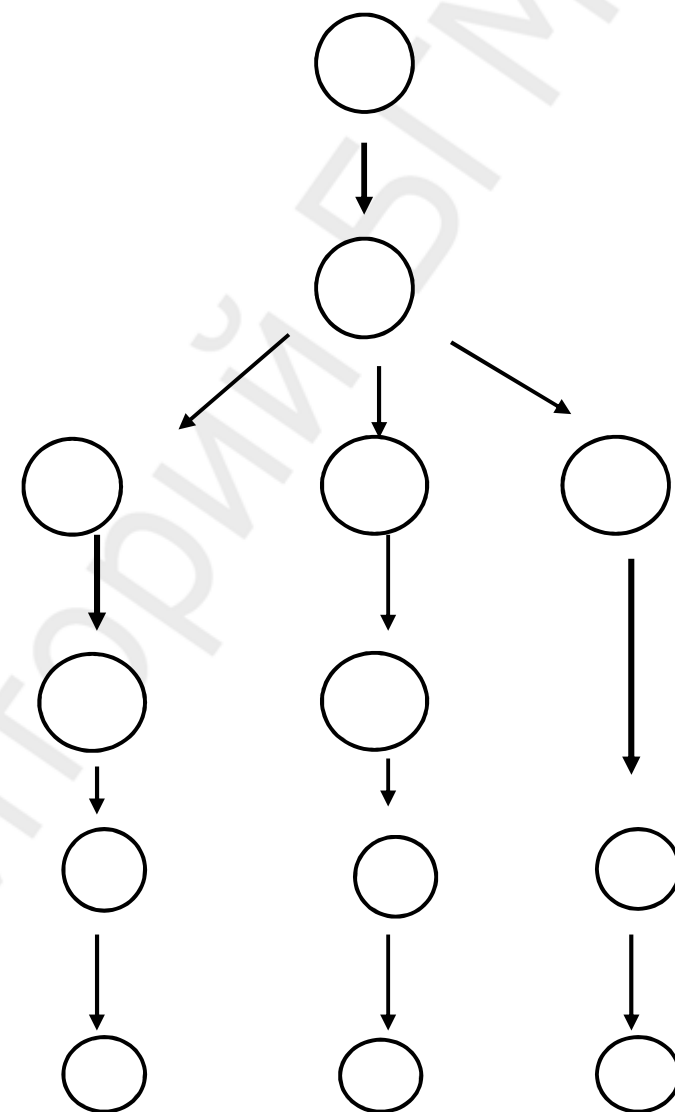
hepatic period – **in green**;

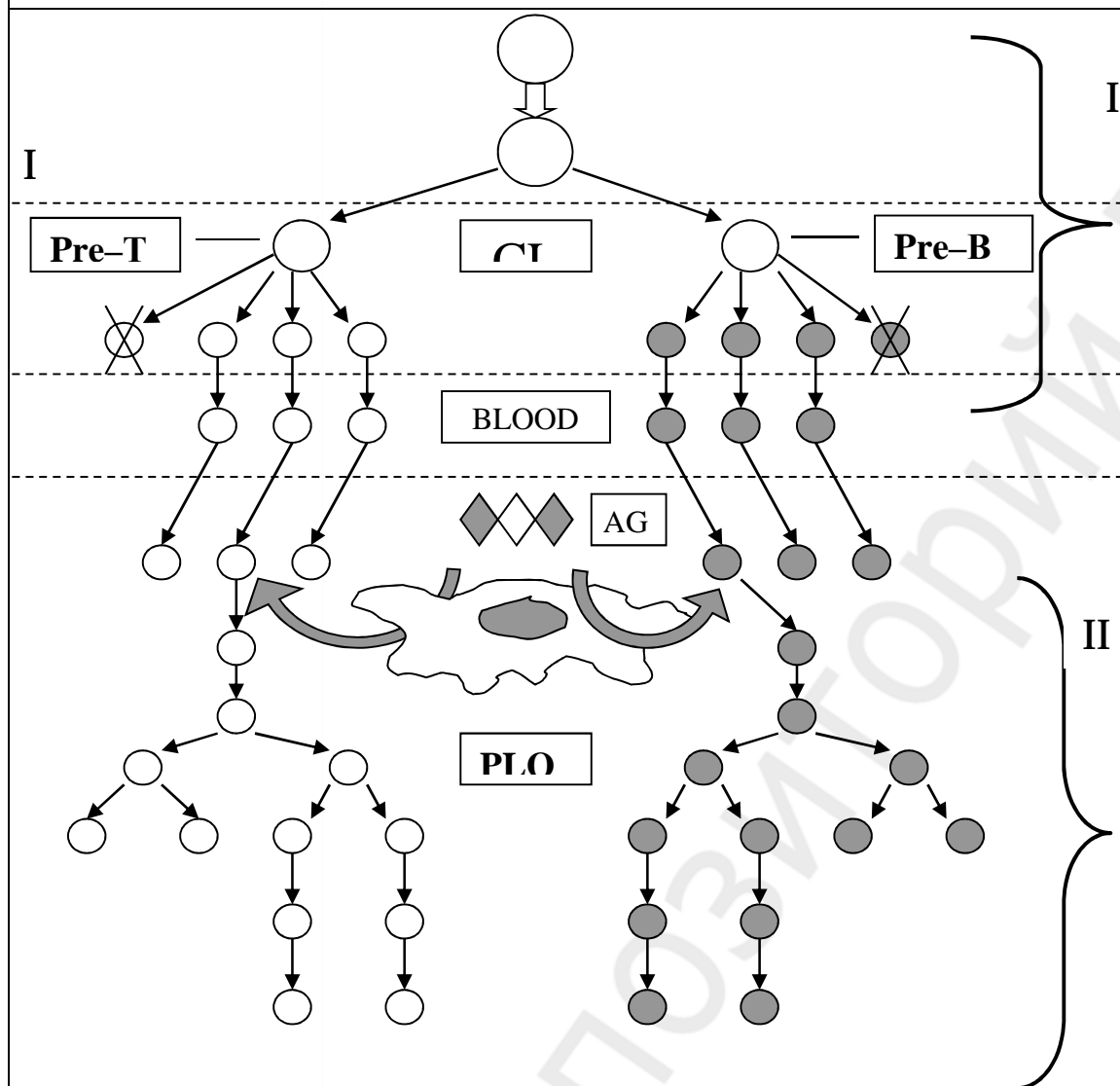
23. myeloid period – **in red**.

24.

Task 45 SCHEME of HAEMOPOIESIS



TASK 46	SCHEME OF ERYTHROPOIESIS	TASK 47	SCHEME OF GRANULOPOIESIS
 <p>proerythroblast</p> <p>basophilic erythroblast</p> <p>polychromatophilic erythroblast</p> <p>oxyphilic erythroblast</p> <p>reticulocyte</p> <p>erythrocyte</p>	<p><i>Draw cytoplasm in color and designate</i></p> <ol style="list-style-type: none"> 4. differential cells; 5. maturational cells 6. mature cell <p><i>Write the main characteristic of erythropoiesis</i></p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 		<p><i>DRAW THE CELL AND WRITE THEIR NAME:</i></p> <p>I. BLAST CELL – MYELOBLAST;</p> <p>II. differential cells -</p> <ol style="list-style-type: none"> 1. promyelocytes, 2. myelocytes; <p>III. maturational cells -</p> <ol style="list-style-type: none"> 3. methamyelocytes, 4. band cells; <p>IV. mature cell -</p> <ol style="list-style-type: none"> 5. neutrophil, 6. eosinophil, 7. basophil,



I - antigen independent differentiation

II - antigen dependent differentiation

AG – antigens

Pre-T – precursory T-lymphocyte cells

Pre-B – precursory B-lymphocyte cells

CLO – central lymphoid organs

PLO – peripheral lymphoid organs

Designate:

10 – stem hemapoietic cell;

11 – hemi-stem hemapoietic cell;

12 – antigens;

13 – macrophage;

14 – T-lymphocytes;

15 – B- lymphocytes;

16 – memory cells;

17 – effector T-lymphocytes;

18 – plasmatic cells;

10 - banned clones of lymphocytes

7. **Correct tasks №№** _____

8. **Teacher**

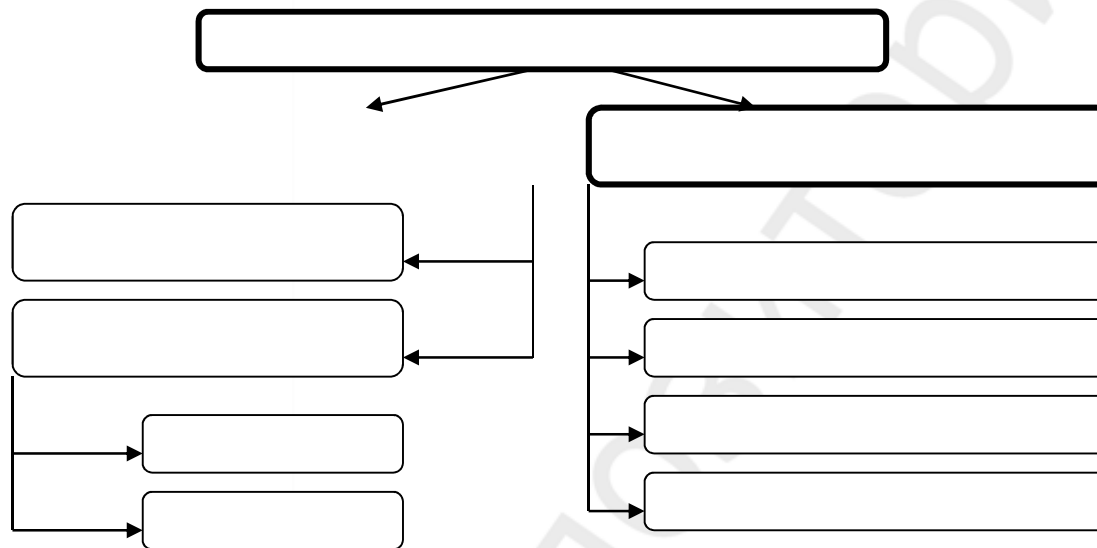
Date « ____ » ____ .

Mesenchyma (origin, localization, morphological and functional characteristics), its derivatives.

1. General characteristics and classification of connective tissues.
2. Development, structure and functions of loose connective tissue.
3. Characteristics of loose connective tissue cells.
4. Formation and structure of intercellular substance loose connective tissue .
5. System of mononuclear phagocytes.
6. Specialized connective tissue.
7. Structure and functions of dense fibrous connective tissues.

31.

32. Classification of connective tissues



Task 49. ORGANIZATION OF CONNECTIVE TISSUE.

Cells:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

INTRACELLULAR SUBSTANCE

Fibers:

- 1.
- 2.
- 3.

Ground amorphous substance

- 1.
- 2.
- 3.

33. **Task 50.**
MESENCHYMA IN
EMBRYONAL
SECTION

36. Stain ing 39. Hematoxylin-eosin
37. 40. 400^x
38. Magnif.

76.
77.
78.
79.
80.
81.
82.
83.
84.
85.
86.
87.

88.
89.
90.

Draw and designate:

34. **Task 51.** LOOSE IRREGULAR
CONNECTIVE TISSUE

41. Stain ing 43. Ferrous hematoxylin
42. Magnif. 44. 400^x

91.
92.
93.
94.
95.
96.
97.
98.

35. **Task 52.** STRUCTURAL ORGANIZATION OF
COLLAGENOUS SUBSTANCE AND ELASTIC FIBERS

45. Aminoacids are taken up by cell and linked to form

46.

47.

48. PRO- α - CHAINS

49.

50.

51.

52.

53.

54. Three such chains join to form a

55.

56.

57.

58. PROCOLLAGEN
MOLECULE

59.

60.

61. Such molecules leave the cell
through secretory vacuoles to form

62.

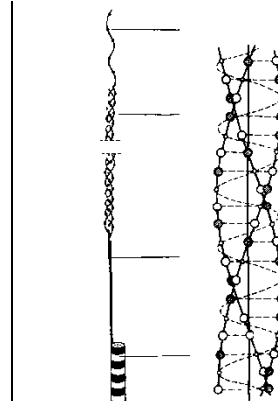
63.

64. TROPICOLLAGEN
MOLECULES

65.

66.

67.



73.



74.

75.

A

Б

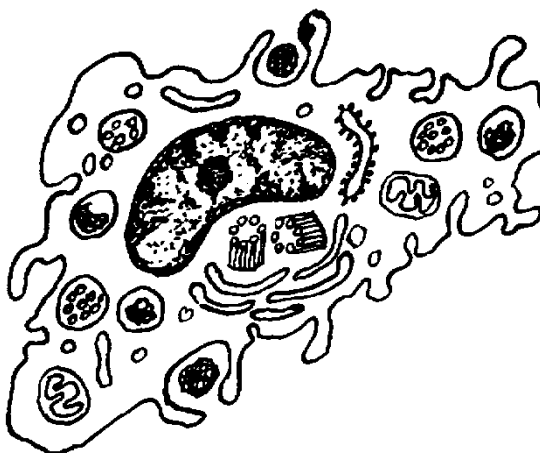
1 – mesenchymal cells nuclei; 2 – mesenchymal cells processes; 3 – intercellular substance; 4 – blood vessel.	Draw and designate: 1 – collagenous substance; 2 – elastic fiber; 3 – basic substance; 4 – fibroblast; 5 – macrophage; 6 – lymphocyte. 7 – mast cell nucleus; 8 – granules in mast cell cytoplasm; 9 – mast cell degranulation 99.	68. Which aggregate to form 69. 70. 71. 72. <p style="text-align: center;">↓ COLLAGEN FIBERS</p>	Designate: A 100. 1. polypeptide chain; 101. 2. tropocollagen; 102. 3. protofibrils 103. 4. striated fibril; 104. 5. collagenous substance; 105. 6. spinal structure of collagen micromolecule 106. B 107. 6. elastin; 108. 7. microfibrils
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109.

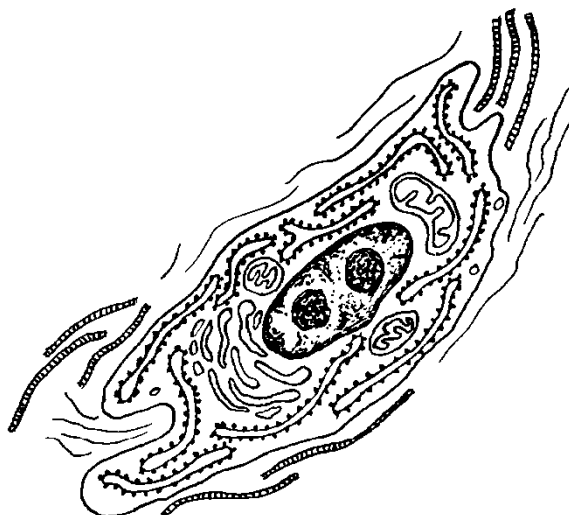
111.

110. Task 53.

112. ULTRASTRUCTURE OF LOOSE IRREGULAR CONNECTIVE TISSUE CELLS



113.



114.

Designate:

115.I – fibroblast:

- 1 – granular endoplasmatic reticulum;
- 2 – complex Golgi;
- 3 – collagen and elastic fiber.

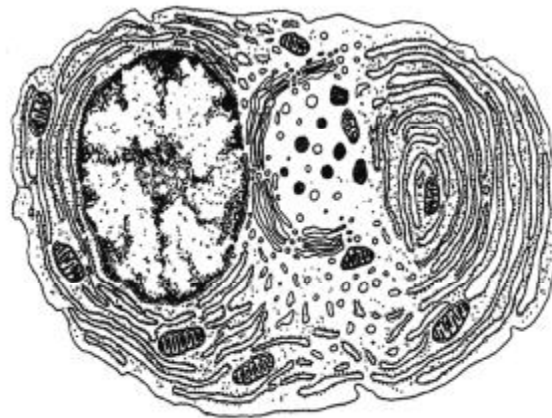
Name:

116. precursory cell _____

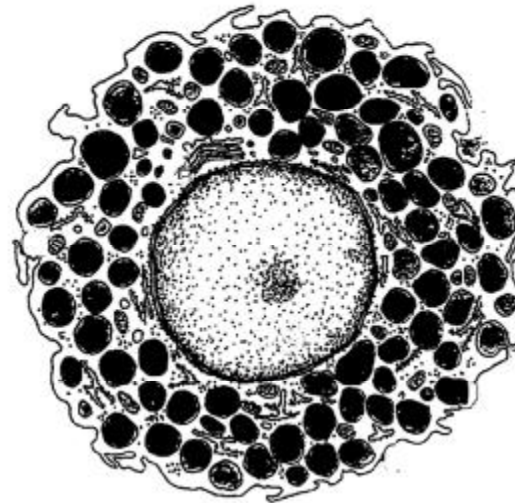
117. cellular function _____

118.I I – macrophage (histiocyte):

- 1 – lisosome;
- 2 – phagosome;
- 3 – pinocytotic vesicles.



127.



128.

Name:

119. precursory cell _____

120. cellular function _____

121.III – plasmocyte:

1 – ergastoplasm;

2 – complex Golgi .

Name:

122. precursory cell _____

123. cellular function _____

124.IV – Mast cell (labrocyte):

1 – heterogenous granules with heparine and histamine.

Name:

125. precursory cell _____

126. cellular function _____

129.

130.Task 54. ADIPOSE TISSUE

131.

132.

134.

135.Task 55. WHITE ADIPOSE TISSUE

138. Staini ng 140. Sudan III

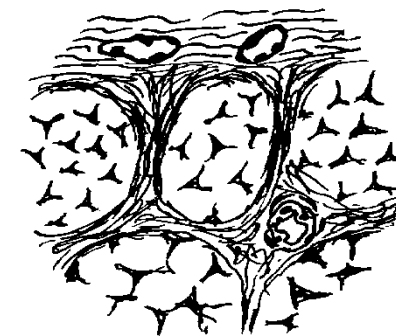
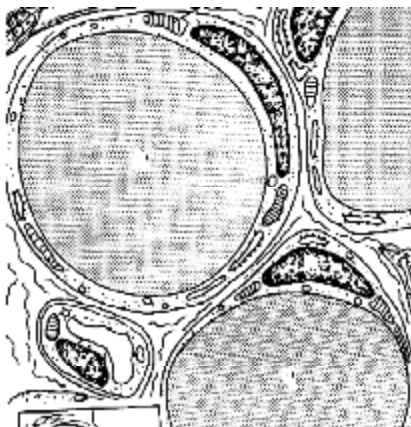
139. Magn if. 141. 400^x

136.

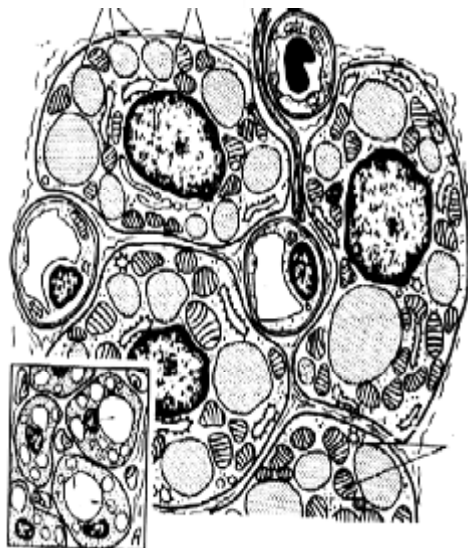
137.Task 56. DENSE REGULARY CONNECTIVE TISSUE OF THE TENDON

142. Staining 144. Hematoxylin-eosine

143. Magnif. 145. 400^x



146.



Designate:

A- white adipose tissue; B – brown adipose tissue

- 1 – adipocyte;
- 2 – adipocyte nucleus;
- 3 – fat droplets;
- 4 – mitochondria;
- 5 – blood capillaries;
- 6 – nerve fiber.

Draw 3-4 cells and designate:

- 1 - adipocyte nucleus;
- 2 - fat droplet.

- 147.
- 148.
- 149.
- 150.
- 151.
- 152.
- 153.
- 154.

155. A – cross-section

156. B – longitudinal section

Draw and designate in the picture and scheme:

- 157.1 – fibrocytes; 2 – 1st level bands; 3 – 2nd level bands; 4 – peritenoneum; 5 – endotenoneum; 6 – blood vessels.

9. **Correct tasks №№** _____

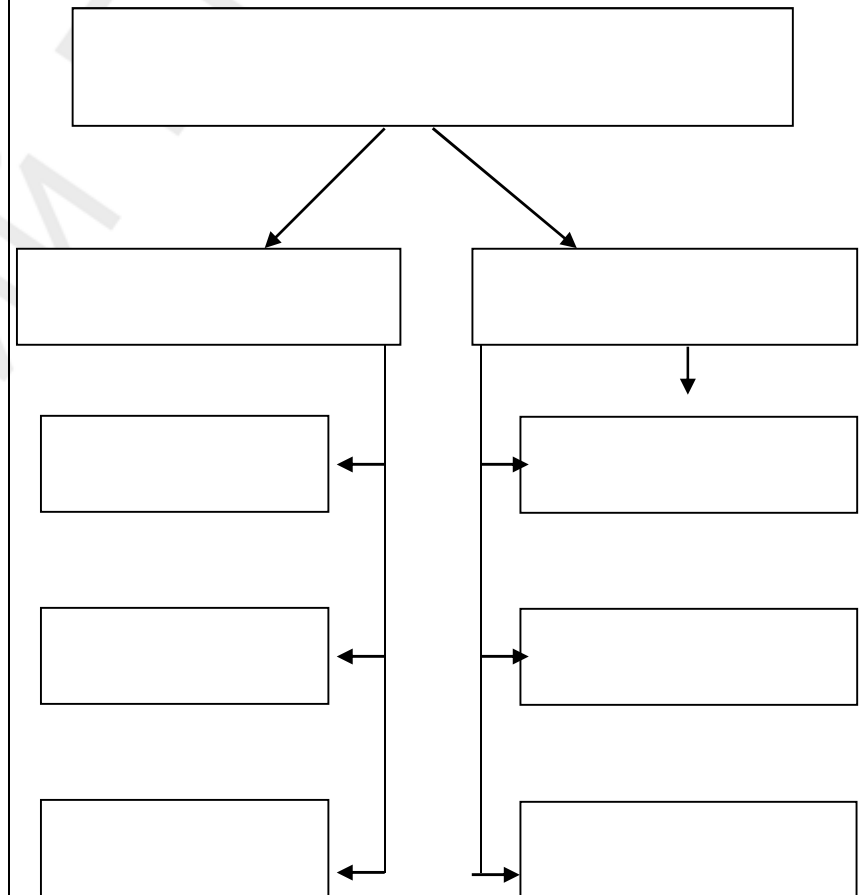
10. **Teacher**

Date « ____ » _____ .

Topic: CARTILAGINOUS AND bone TISSUES

- 158. General morphological and functional characteristics, classification of cartilaginous tissues.
- 159. Structural peculiarities of different cartilaginous tissue types.
- 160. Development, growth, regeneration and age-related changes of cartilage as an organ.
- 161. General morphological and functional characteristics and classification of bone tissues. Bone as an organ. Periosteal structure and function.
- 162. Structure of reticulofibrous (woven, immature) bone tissue: cells, intercellular substance.
- 163. Structure of lamellar (mature) bone tissue. Compact and spongy (cancellous) bone substance.
- 164. Development of bone tissue (direct and indirect osteogenesis).

Task 57. CLASSIFICATION OF SKELETAL TISSUE



Task 58.**HYALINE CARTILAGE**

Hematoxylin-eosin

400^x

Staining

Magnification

Draw and designate:

- 1 – perichondrium;
- 2 – chondroblasts;
- 3 – chondrocytes;
- 4 – isogenous groups of cells;
- 5 – intercellular substance;
- 6 – basophilic area of intercellular substance.

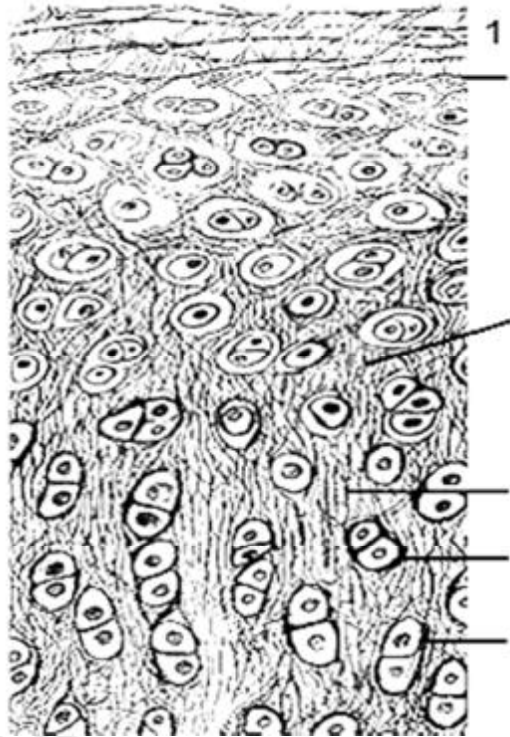
Task 59.**ELASTIC CARTILAGE**

Hematoxylin-eosin

400^x

Staining

Magnification

**Designate:**

- 7 – perichondrium;
- 8 – chondroblasts;
- 9 – chondrocytes;
- 10 – isogenous groups of cells;
- 11 – elastic fibers of intercellular substance.

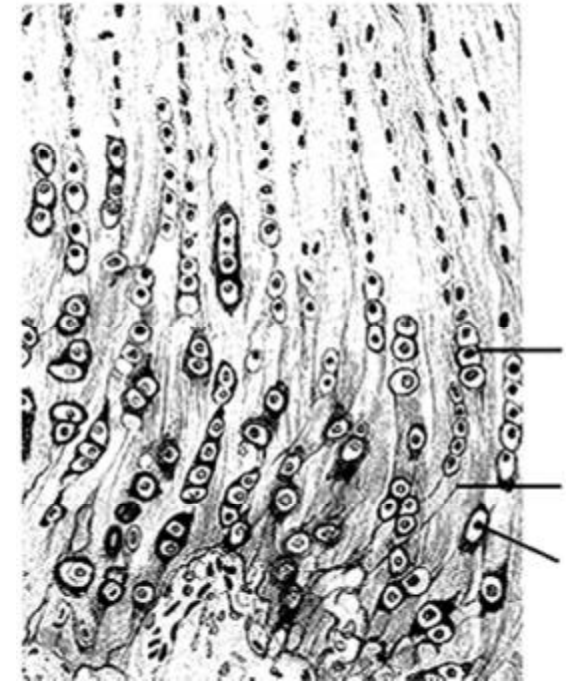
Task 60.**FIBROUS CARTILAGE**

Hematoxylin-eosin

400^x

Staining

Magnification

**Designate:**

- 1 – chondrocytes;
- 2 – isogenous groups of cells;
- 3 – collagen fibers.

Task 61. INTRAMEMBRANOUS
OSSIFICATION
(DIRECT
OSTEOGENES)
Hematoxylin-eosin
400^x

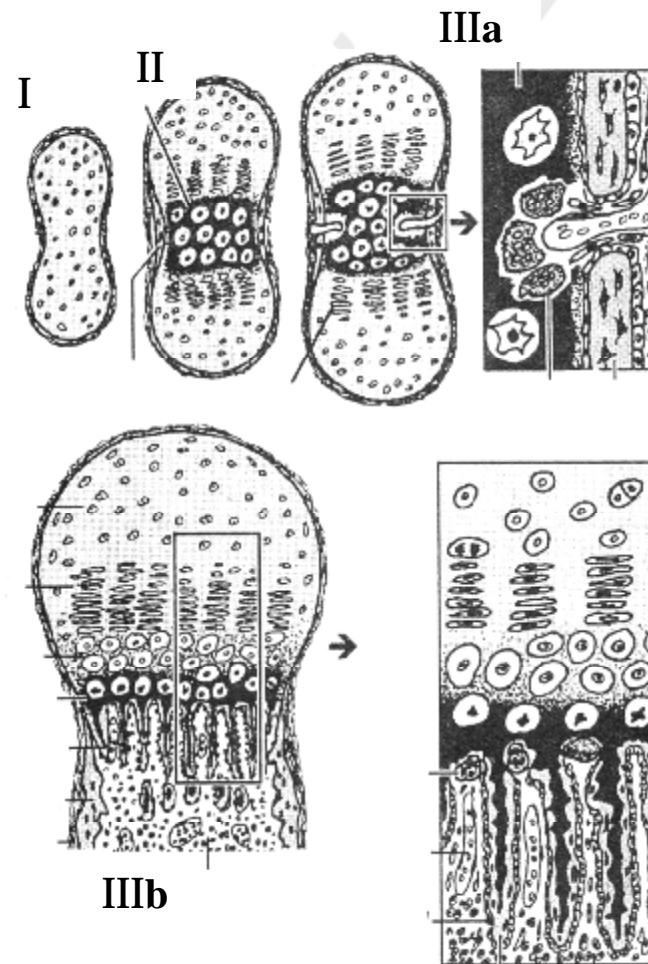
Staining
Magnific.

Draw and designate:

- 1 – mesenchyma;
- 2 – osteoblasts;
- 3 – osteocytes;
- 4 – osteoclasts;
- 5 – intercellular substance of
reticulofibrous bone tissue;
- 6 – blood vessels.

Task 62. ENDOCHONDRAL OSSIFICATION (INDIRECT
OSTEOGENES)
Hematoxylin-eosin
400^x

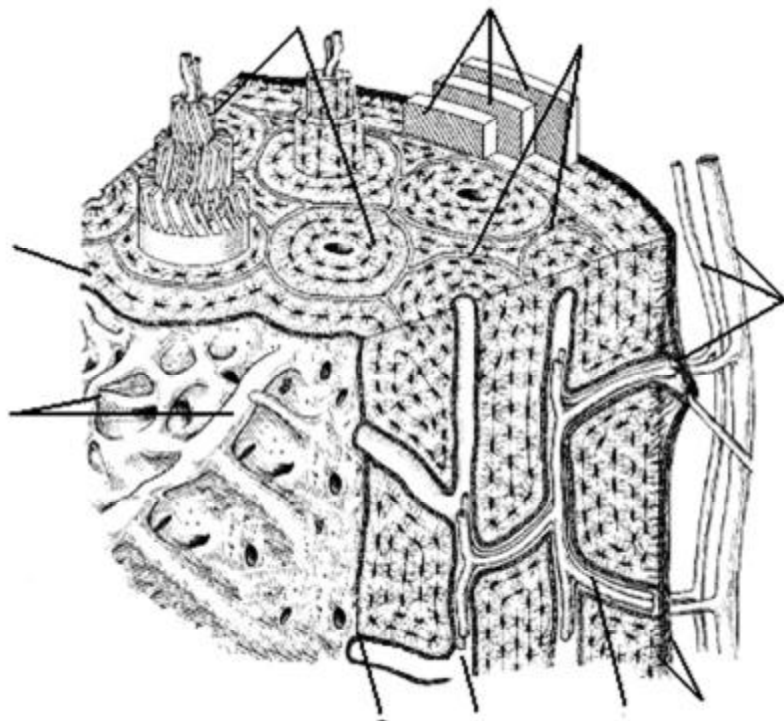
Staining
Magnific.



Designate;

- I Hyaline cartilage “model”;
- II primary ossification center
 - 1.bony collar –perichondral bone
- III calcified cartilage
 - a** osteogenic cells,osteoclasts, blood vessels penetrate into cartilage;
 - b** forming enchondral bone
- 2. zone of resting cartilage;
- 3. zone of proliferating cartilage (column cartilaginous cells);
- 4.. zone hypertrophied cartilage
- 5. zone calcified cartilage;
- 6.zone of resorption and ossification;

Task 63. STRUCTURAL SCHEME OF COMPACT SUBSTANCE of LONG BONE



Designate:

- 1 – periosteum with blood vessels;
- 2 – blood vessels;
- 3 – outer layer of general lamellae ;
- 4 – osteons;
- 5 – osteon canals;
- 6 – trophic canal;
- 7 – system of interstitial lamellae;
- 8 – inner layer of general lamellae;
- 9 – endosteum.

Task 64. CROSS-SECTION OF COMPACT SUBSTANCE of LONG BONE
Staining After Schmorl
Magnification 400^x

Designate:

- 1 – osteon canal;
- 2 – osteon lamellae;
- 3 – lacuna (osteocyte bodies);
- 4 – canaliculi osseum (osteocyte processes);
- 5 - interstitial lamellae

Correct tasks №№ _____

Teacher

Date « ____ » _____ .

Topic: MUSCULAR TISSUES

8. General characteristics of muscle tissues (classification, sources of development, location in the body, basic structural principles, functions, regeneration, peculiarities of blood supply and innervation).
9. Comparative characteristics of different types of muscle tissue structural units: morphofunctional units, peculiarities of its structure, principles of location in the tissue and types of intercellular contacts.
10. Smooth muscle tissues: structure of smooth myocytes, contraction apparatus and molecular mechanism of contraction.
11. Skeletal muscle tissue. General plan structure of the muscle fibres. Contraction apparatus of muscle fibres. Structure of sarcomere. Mechanism of muscle contraction.
12. Structure of skeletal muscle as an organ. Myon. Comparative characteristic of different types of skeletal muscular fibers (red, white and intermediate fibers).
13. Cardiac muscular tissue. Comparative characteristic of different types of cardiomyocytes (contractile and conductive cardiomyocytes).

165. **Muscle tissues** provide movement of the whole body, its parts and inner organs.
166. It results from constriction (shortening) of muscle cells or fibers as a result of contraction of their special elements – **myofilaments** in the form of actin and myosin.

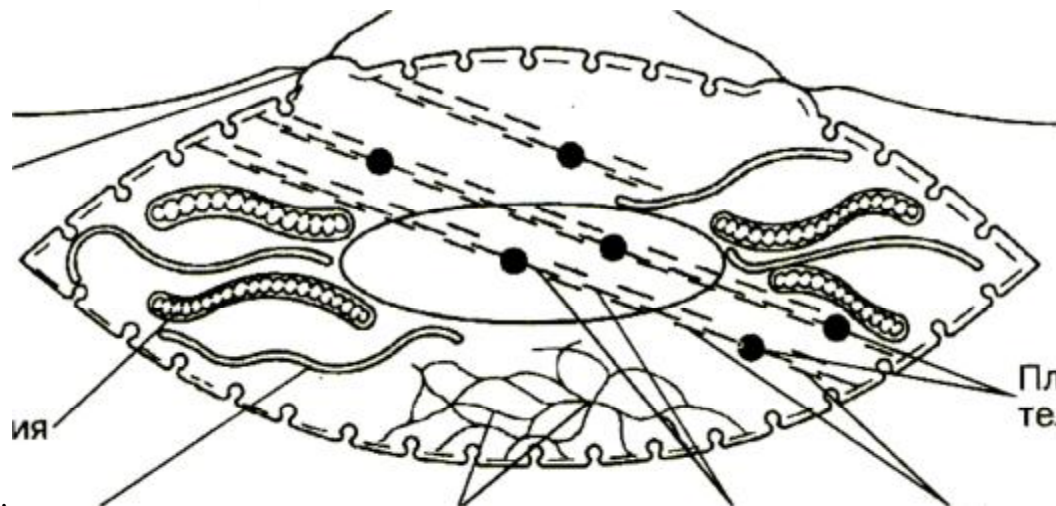
167.
168.

169. Task 65. MAIN CHARACTERISTICS OF 170. VARIOUS TYPES OF TISSUES

171.	172. Skeletal 173. muscle 174. tissue	175. Cardiac 176. muscle 177. tissue	178. Smooth 179. muscular 180. tissue 181.
182. Sources of 183. development	184.	185.	186.
187. Structural 188. and functional unit	189.	190.	191.
192. Number of nuclei and 193. its location	194.	195.	196.
197. Capability of 198. regeneration 199.	200.	201.	202.

203.

204. 206.
205. Task 66. 207. SCHEME OF SMOOTH MUSCLE CELL'S ORGANIZAION



215.
 216.
 217.
 218.
 219.

Designate:

223. 1 - nucleus; 2 - plasma membrane; 3 - caveolae ; 4 - mitochondria; 5 - smooth endoplasmic reticulum; 6 - intermediate filaments; 7 - thin (actin) filaments; 8 - thick (myosin) filaments; 9 - dense bodies; 10 - gap junction between cells.

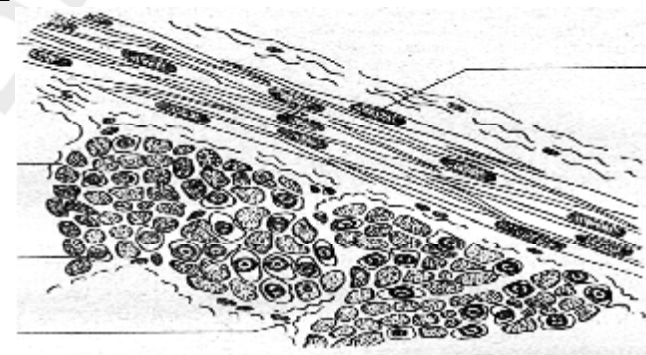
208. 211.
209. Task 67. 212. SMOOTH MUSCULAR TISSUE OF URINARY BLADDER WALL

Staining

210. Magnifica

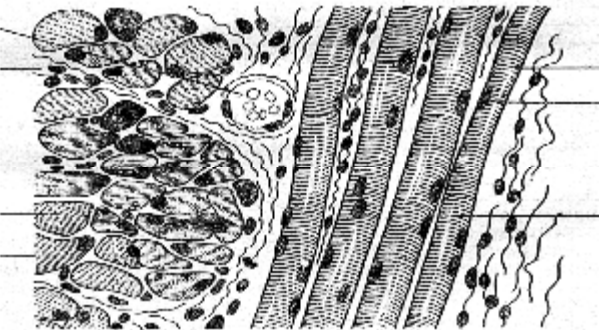

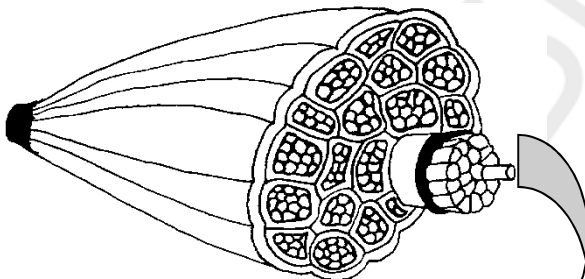
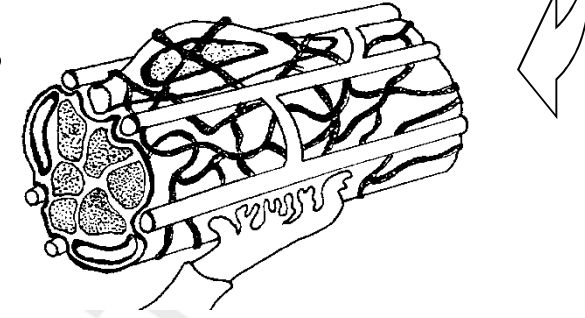
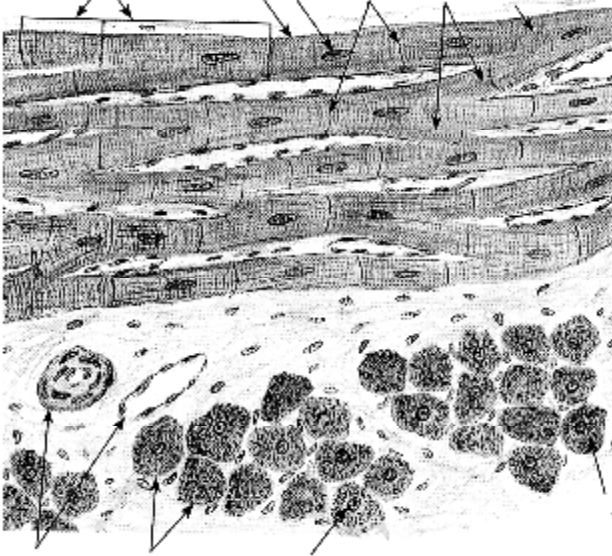
tion

220. A

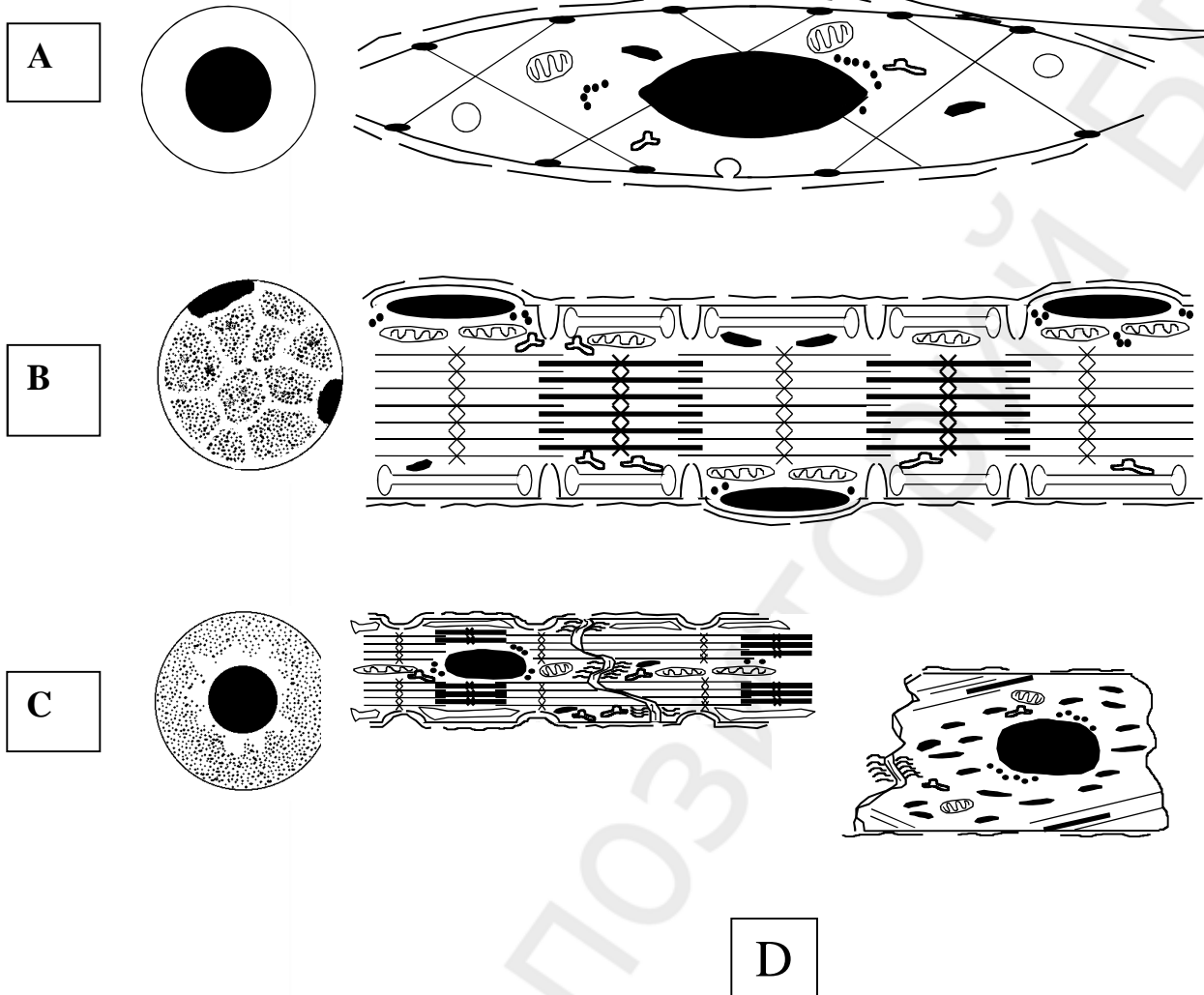


221.
222. B

224.
 225. Designate scheme (A) and picture (B):
 226.
 1 - muscular cells in longitudinal section
 2 - muscular cells in cross section
 3 - muscular cells nuclei
 4 - connective tissue (perimysium)

<p>Task 68.</p> <p>SKELETAL MUSCLE TISSUE OF THE TONGUE</p> <p>Staining Iron hematoxylin</p> <p>Magnification 400^x</p> <p>A</p>  <p>B</p>  <p>227.</p> <p>228. Designate scheme (A) and picture (B):</p> <p>229.</p> <p>230.1 – longitudinal section of muscle fibers; 2 – transversal section of muscle fibers; 3 – sarcolemma; 4 – muscular fiber nucleus; 5 – endomysium; 6 – perimysium.</p>	<p>Task 69.</p> <p>SCHEME OF MUSCLE'S STRUCTURE AS AN ORGAN</p>  <p>B</p>  <p>Designate:</p> <p>A – structure of muscle:</p> <p>1 – epimysium; 2 – perimysium; 3 – muscular fiber.</p> <p>B – structure of myon:</p> <p>4 – muscle fiber (myosymplast); 5 – myosatellitocyte; 6 – α-motoneuron axon and its contact with myosymplast; 7 – endomysium: 7a – capillaries; 7b – elastic and reticular fibers.</p>	<p>Task 70.</p> <p>CARDIAC MUSCLE TISSUE</p> <p>Staining Iron hematoxylin</p> <p>Magnification 400^x</p>  <p>Designate:</p> <p>1- cardiomyocyte nucleus;</p> <p>2- intercalated disc;</p> <p>3- anastomosis;</p> <p>4- myofibrils;</p> <p>5- connective tissue.</p>
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Task 71. Stuctural Scheme Of Muscular Tissue Elements



Designate:

231.A – smooth muscular tissue myocyte (SMT);

232.B – skeletal muscular tissue myosymplast;

233.C – contractile cardiomyocyte;

234.D – conductive cardiomyocyte.

Supporting structure

1 – sarcolemma: 1a – cytolemma; 1b – basal membrane; 1c – T-tubules; 2 – myofibril attachment site: 2a – in SMT (dense bodies and dense stripes); 2b – in myosymplast – Z- and M-lines;

Trophic apparatus

3 – nucleus; 4 – mitochondria; 5 – smooth endoplasmatic reticulum (Ca^{++} depot): 5a – SMT vesicles and caveolae; 5b – L-tubules and terminal cisterns in myosymplast; 6 – ribosomes; 7 – glycogen inclusions; 8 – myoglobin inclusions;

Contractile apparatus

9 – actin and 10 – myosin myofilaments;

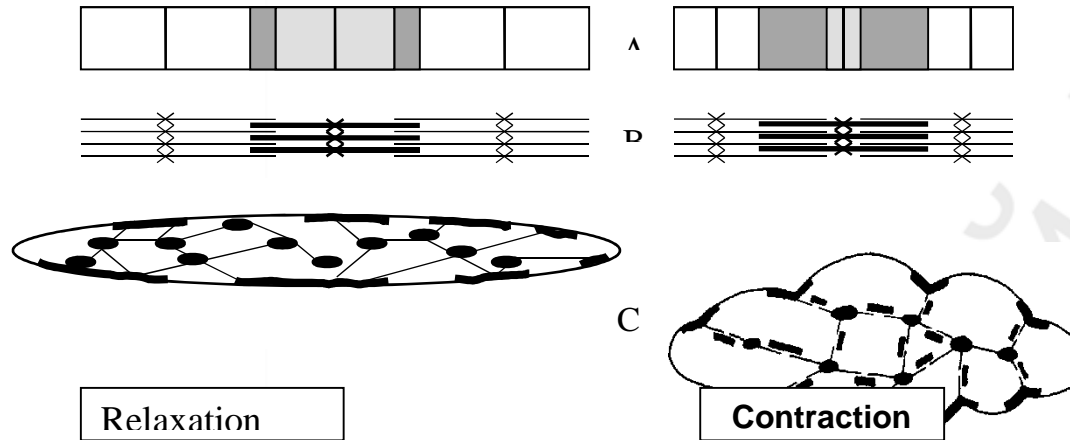
Intercellular contacts

11 – nexuses; 12 – desmosomes; 13 – interdigitations;

Cross sections

14 – nuclei; 15 – myofibrillar fields.

Task 72. CONTRACTION OF STRIATED AND SMOOTH MUSCULAR TISSUES



Designate:

A – sarcomere contraction: 1- band **I**; 2 – band **A**; 3 – **Z**-line; 4 - **M**-line; 5 – **H**-zone; 6 – sarcomere.

B – myofibrillar contraction: 7 – **M**-line; 8 – **H**-zone; 9 – myosin filaments; 10 – actin filaments.

C –SMC contraction: 11 – actin myofilaments; 12 – myosin myofilaments; 13 – sites of actin myofilament attachment in cytoplasm (dense bodies) and 14 – to cell carcolemma (dense stripes)

Task 73. COMPARATIVE CHARACTERISTICS OF VARIOUS TYPES OF CARDIOMYOCYTES

	Contractile	Conductive
Functions		
Type of exchange		
Resistance to oxygen insufficiency		
Predominant type of inclusions		
Mitochondria (number and size)		
Myofibrils (number and location)		
Location in myocardium		

Topic: NERVE Tissue		
<p>235.</p> <ol style="list-style-type: none"> 1. Nerve tissue. General morphological and functional characteristics. Sources of development, histogenesis. 2. Neurons. Classification (morphological, functional, mediatorial). Morphological and functional characteristics of neurons. Transporting processes in neurocytes. 3. Neuroglia. Classification and development. Morphological and functional characteristics of different types of neuroglia. 4. Nerve fibers. Classification. Morphological and functional characteristics of myelinated and unmyelinated fibers. Process of myelinisation. Degeneration and regeneration of nerve fibers. 5. Nerve endings (receptive and efferent types), classification and structure. 6. Interneuronal synapses. General plan of synapses organization. Classification, structure, transmission of nerve impulse. <p>236. 7. Reflex arch - morphological base of nervous activity. Basic structural elements of a reflex arch. Simple and complex reflex arches.</p> <p>237.</p>		
<p>Development sources of nerve tissue</p>	<p>{ I – II – III –</p>	<p>Classifications of neurons:</p> <p>I. Morphological</p> <ol style="list-style-type: none"> 1. 2. 3. 4. <p>II. Functional</p> <ol style="list-style-type: none"> 1. 2. 3. 4.

238. Morphological and functional unit of nerve tissue: _____
 239. _____

III. Mediatorial

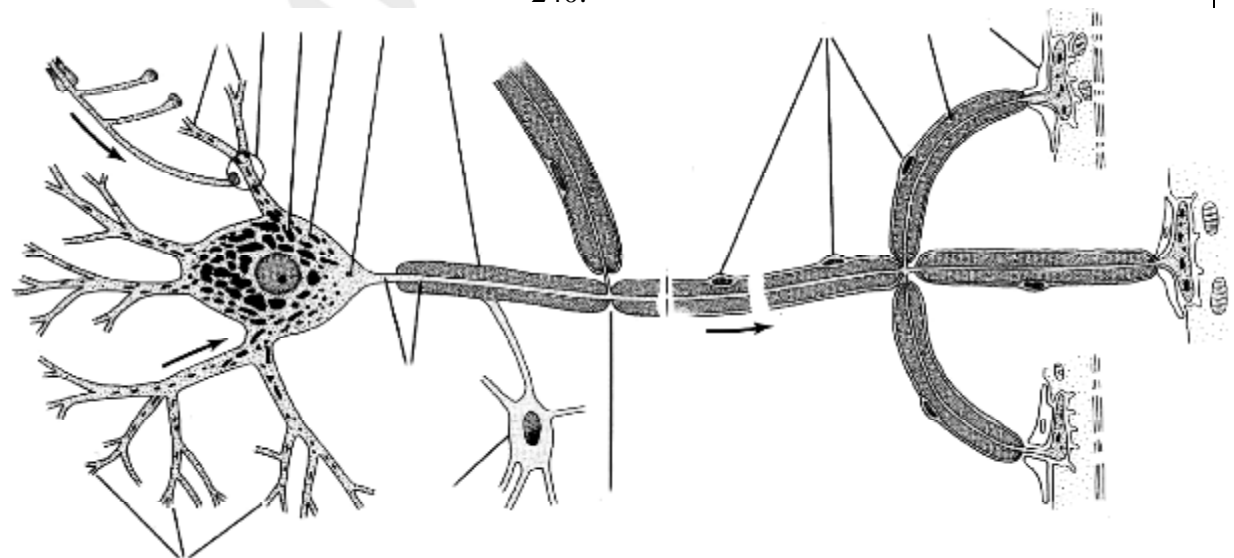
- 1.
- 2.
- 3.
- 4.
- 5.

Task 74. STRUCTURAL SCHEME OF THE NEURON

Mark:

- 1 – nerve cell nucleus;
- 2 – axon;
- 3 – dendrites;
- 4 – cell body;
- 5 – basophilic substance (Nissl bodies);
- 6 – axon hillock;
- 7 - oligodendrocyte;
- 8 - recurrent axonal branch;
- 9 - axodendritic synapse;
- 10 - axial cylinder;
- 11 - myelin sheath;
- 12 - node of Ranvier;
- 13 - Schmidt-Lanterman cleft;
- 14 - lemmocyte nucleus;
- 15 - neuromuscular synapse;
- 16 - striated muscular fiber.

240.



241.

242.

243. Task 75. BASOPHILIC SUBSTANCE OF THE SPINAL CORD'S NEURONS

244. Staining: Toluidine blue

245. Magnification 400^x

246.

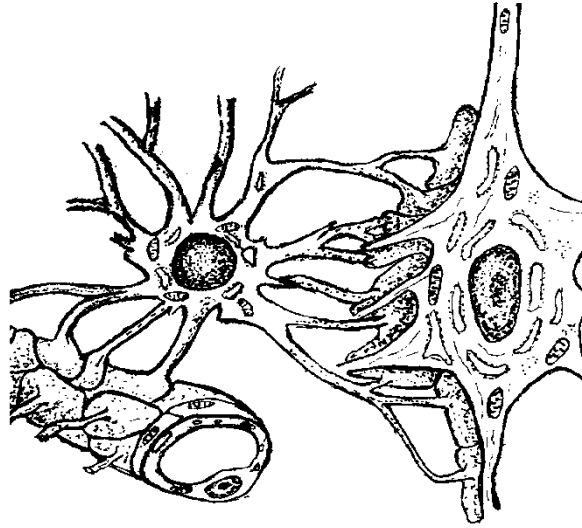
247. Task 76. NEUROFIBRILS OF THE SPINAL CORD'S NEURONS

248. Staining: Silver impregnation

249. Magnification 400^x

250.

		251. 252. 253.		
Designate: 1 – nucleus; 2 – basophilic substance (Nissl bodies); 3 – axon; 4 – dendrites.				Designate: 1 – nucleus of neuron; 2 – neurofibrils; 3 – axon; 4 – dendrites.
Task 77. Staining: Magnification	MICROGLIA Silver impregnation 400 ^x	Task 78. SCHEME OF INTERACTIONS ASTROCYTE WITH HEMOCAPILLARY AND NEURON	Task 79. SCHEME OF HEMATO-LIQUER BARRIER	

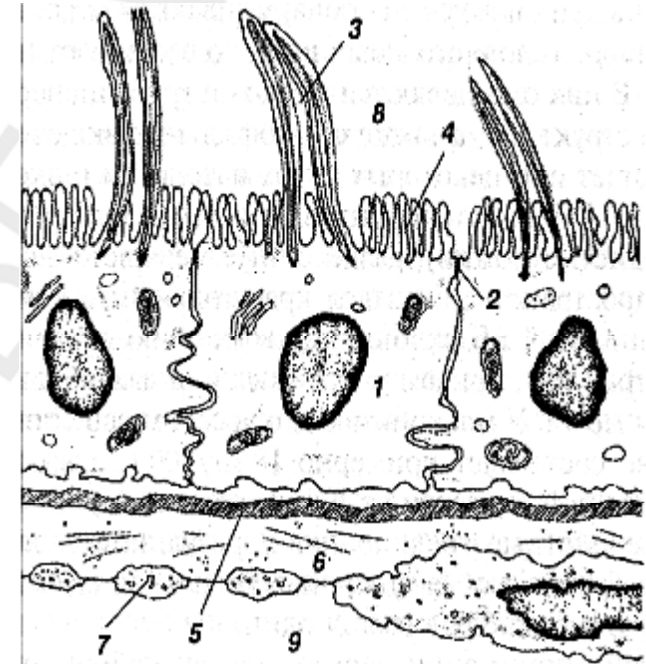


Draw and designate:

1 – microglial cells.

Deignate:

1 – astrocyte body; 2 – astrocyte nucleus;
3 – perivascular feet; 4 – perineural feet;
5 – hemocapillary endothelium; 6 – neuron;
7 – neuron nucleus; 8 – perikaryon; 9 –
neuron processes.



Deignate:

1 – ependymocyte; 5 – basal membrane;
2 – tight junction; 6 – perivascular space;
3 – ependymocyte cilia; 7 – endothelium.
4 – ependymocyte microvilli;

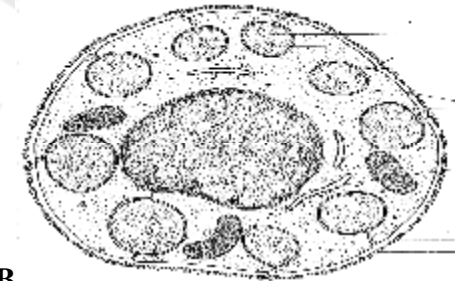
Origin		Origin		Origin	
Function		Function		Function	

Task 80. NON-MYELINATED NERVE FIBRES
 Staining Hematoxylin-eosin
 Magnification 400^x

A

Designate picture (A) and scheme (B):

1 – lemmocyte nuclei; 3 – axial cylinders;
 2 – non-myelinated nerve fibres; 4 – mesakson.
 254.



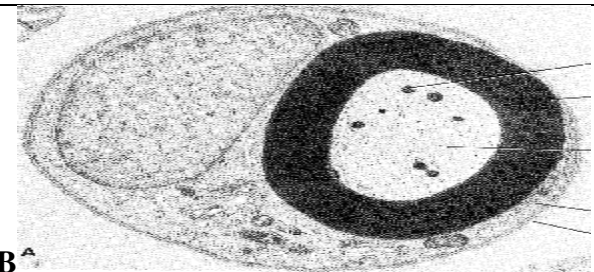
255. **B**

Задание 81. 257. MYELINATED NERVE FIBRES
 Staining: 258. Osmic acid
 256. Magnificati 259. 400^x
 on

A

Designate picture (A) and scheme (B):

1 – axial cylinder; 4 – lemmocyte nuclei;
 2 – myelinated nerve fiber; 5 – node of Ranvier;
 3 – neurolemma; 6 – myelin layer.
 7 – 8 –
 9 – 10 –

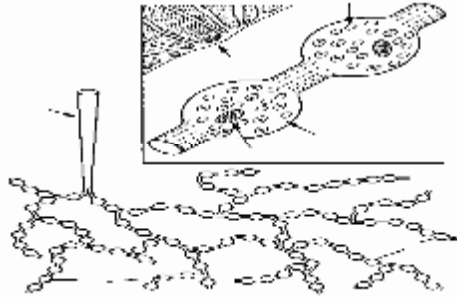


260. **B**

261.

262.

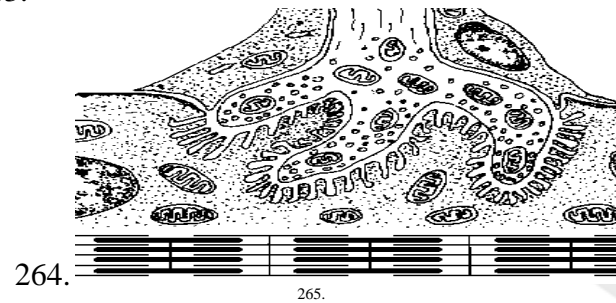
Task 82. EFFERENT ENDING OF SMOOTH MUSCLE



Designate:

- 1 – smooth cells;
- 2 – axon;
- 3 – axon terminals;
- 4 – varicose dilations;
- 5 – vesicles with mediator;
- 6 – mitochondria.

Task 83. NEUROMUSCULAR SYNAPSE
263.

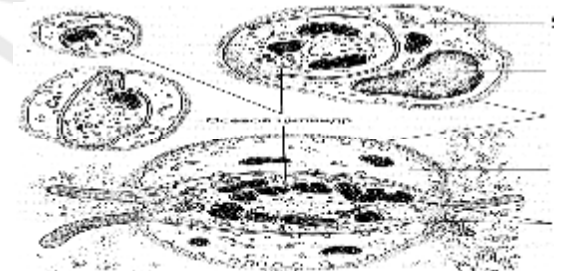


266.

267. Designate:

- 1 – presynaptic membrane;
- 2 – synaptic vesicles;
- 3 – axon mitochondria;
- 4 – oligodendrocyte;
- 5 – postsynaptic membrane;
- 6 – myosinplasm nucleus;
- 7 – mitochondrion of muscle fiber;
- 8 – myofibrils;
- 9 – synaptic cleft.

Task 84. NONFREE NONENCAPSULATED ENDINGS



268.

269. Designate:

270.

- 271. 1 – terminal of sensory nerve fibres; 2 – modified Schwann cells; 3 – nucleus of Schwann cell; 4 – basal lamina.

272.

11. Correct tasks №№ _____

12. Teacher

Date « ____ » _____

Topic: CARDIOVASCULAR SYSTEM

273.

1. General morphological and functional description of the cardiovascular system. Principles of vessel innervation and nourishments.
2. Classification of vessels, their development, general structure.
3. Arteries. Classification. Dependence of the artery wall structure on haemodynamic conditions.
4. Veins. Classification. Influence of haemodynamic conditions on the vein wall structure.
5. Microcirculation. The structure and functional description of its vessels. Capillaries: classification, organ specificity. Histo-haematic barrier. Lymphatic capillaries.
6. Anastomoses between arterioles and venules. Classification. Structure, functional description.
7. The heart. Sources and stages of development, structure of cardiac membranes. Structure of heart valves.
8. Morphofunctional and histochemical description of contractile cardiac muscle tissue. Regeneration.
9. Conductive cardiac system. Ultrastructural and histochemical description of conductive myocytes. Peculiarities of interaction between conductive cardiac system and contractile cardiomyocytes.
10. Secretory cardiomyocytes, their morphological and functional description.

The functions of the cardiovascular system:

1. _____

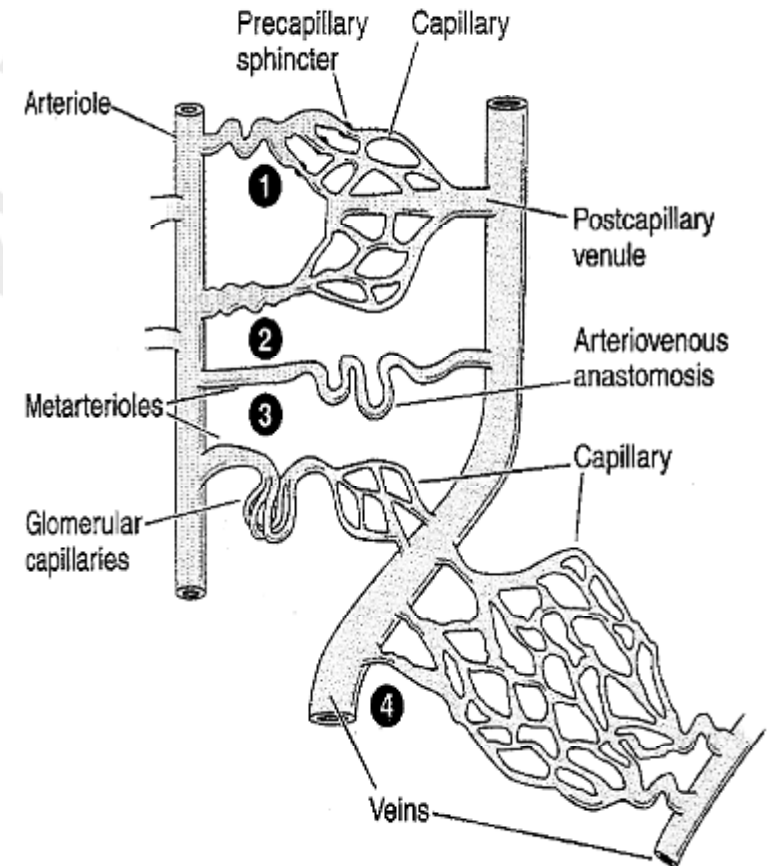
274.2.

275.3.

276.4.

—

TYPES OF MICROCIRCULATION FORMED BY SMALL BLOOD VESSELS



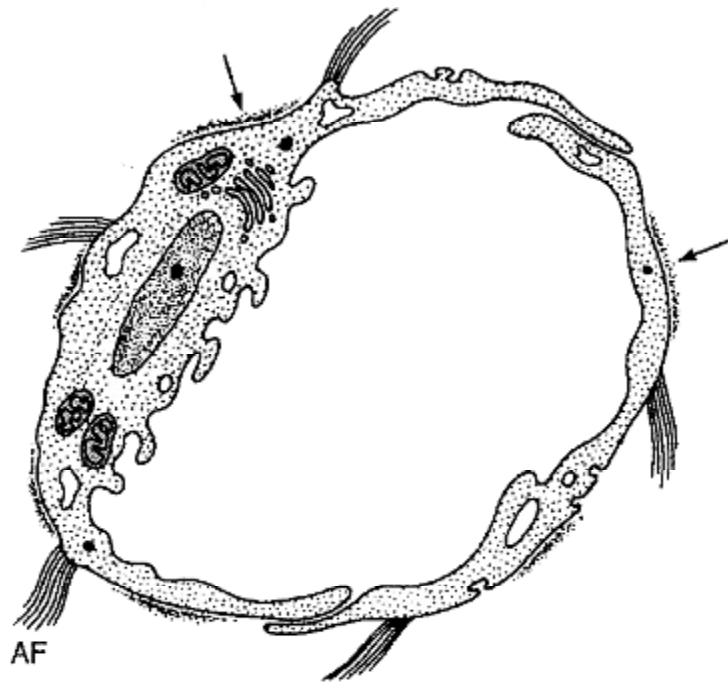
1 –an usual sequence

2 –an arteriovenous anastomosis

3 – an arterial portal system (kidney)

4 - an venous portal system (liver)

Task 110. ULTRAMICROSCOPIC STRUCTURE OF THE LYMPHATIC CAPILLARY WALL

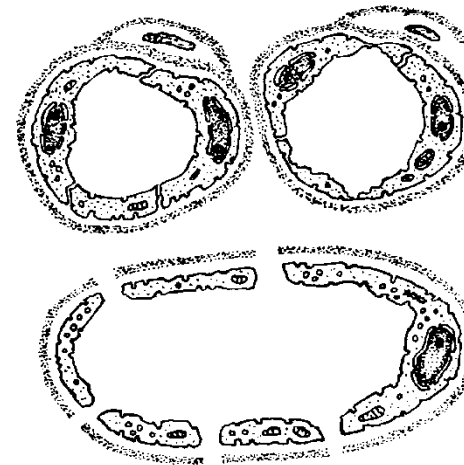


Designate:.

277.

1 — endothelial cells (EC); 2 — EC nucleus; 3 — discontinuous basal membrane; 4 — anchoring (collagen) fibrils.

Task 111. ULTRAMICROSCOPIC STRUCTURE OF THE BLOOD-CAPILLARY WALL



Designate:

278. A — somatic capillary;
B — fenestrated capillary;
C — sinusoidal capillary.

279.

1 — endothelial cells (EC);
2 — EC nucleus; 3 — basal membrane; 4 — pericyte; 5 — EC fenestras; 6 — pores in the EC.

280. The Task 112. SMALL BLOOD VESSELS OF THE SOFT BRAIN MEMBRANE

281.

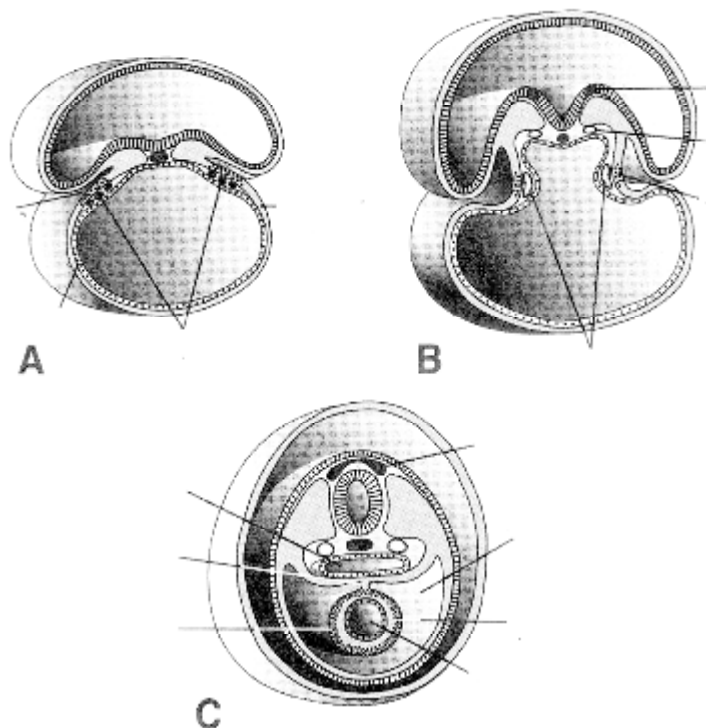


Designate:

1. Arteriole.
2. Venule.
3. Capillary.
4. Myocytes.
5. Endotheliocytic nuclei.
6. Adventitious cells.
7. Erythrocytes.
8. Connective tissue cells.

282.

Task 116. SCHEME OF HEART DEVELOPMENT



To designate:

A — paired rudiments of the heart ; B, C, D — their approachment; E — junction into one unpaired rudiment.

1 – ectoderm; 2 – entoderm; 3 – parietal mesodermal layer; 4 – visceral mesodermal layer; 5 – nerve groove; 6 – nerve tube; 7 – celome; 8 – ventral aortas; 9 – dorsal aortas; 10 – anterior intestine; 11 – junction between ventral aortas; 12 – endocardium; 13 – myocardial and epicardial rudiments; 14 – pericardial cavity.

Task 117. staining Magnification

THE CARDIAC WALL Haematoxylin-eosin 400X

283.

Draw and to designate:

I. Endocardium

1. Endothelial layer.
2. Subendothelial layer.
3. Elastic muscular layer.
4. External connective tissue membrane.

II. Myocardium

5. Nuclei of contractile cardiomyocytes.
6. Fixed intercalated discs.
7. Connective tissue with capillaries.
8. Conductive cardiomyocytes (Purkinier's fibres).
9. Anastomoses between cardiomyocytes.

III. Epicardium

10. Subserous basis .
11. Proper lamina of serous membrane.
12. Mesothelium.

13. Correct tasks №№ _____

14. The lesson is completed

15. Lecturer _____

Date _____

UNIT IV. PARTICULAR HISTOLOGY

Topic **NERVOUS SYSTEM.**Peripheral nervous system

1. Definition of organ. Classification of organs.
2. General morphological and functional characteristics of the nervous system. Sources of development. Classification.
3. Neuronal theory .Conception of nerve centers, their classification, principles of structural organization.
4. Reflex arch, its structural unit. Types of reflex arches.
5. Cerebrospinal ganglia: sources of development, structure, function
6. Spinal cord. Its development. The structure of grey and white matter. Neuron structure.
7. Peripheral nervous system. Nerve, its structure and regeneration
8. Autonomous (vegetative) nervous system: extra- and intramural ganglia.

Definition of organ_____

Classification of organ

Type organ	Character of organ

Stroma_____

Parenchyma_____

Task 85.**NEURON INTEGRATION**

Interaction between neurons is **neuron intergration**.
Neuron integration occurs on basis of such processes as
DIVERGENCE(A)_____

CONVERGENCE(B)_____

Neuron integration proposes the forming **nerve centre**.

NERVE CENTER is structural and functional union of neurons. Synaptic transmission takes place here.

Nerve centre are divided into nuclear nerve center and screen nerve centers.

NUCLEAR NERVE CENTER

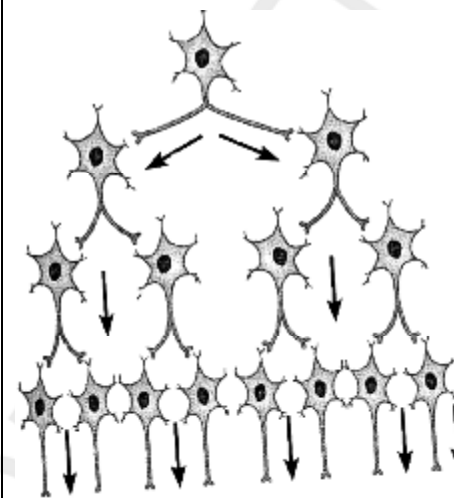
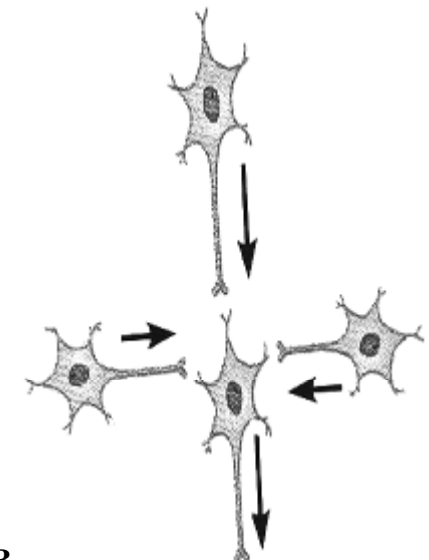
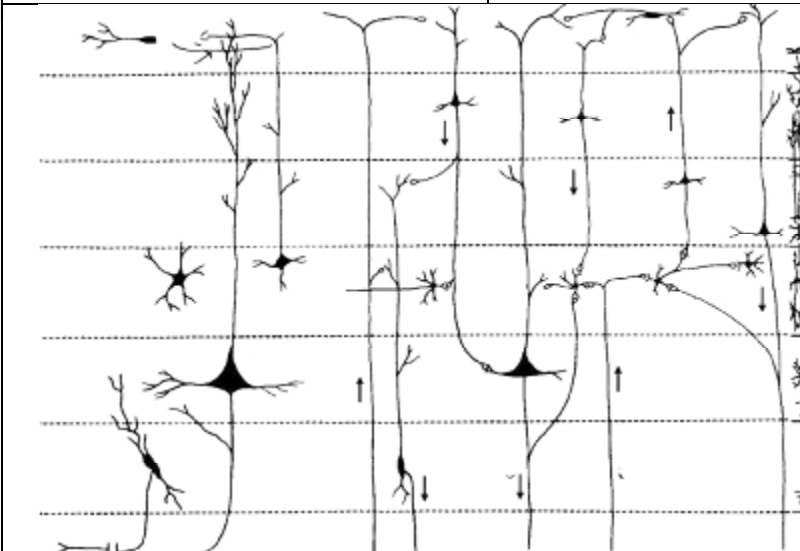
1. Neurons form a compact groups
2. There are a processes of convergence from afferent system

3. There are one type of neuron

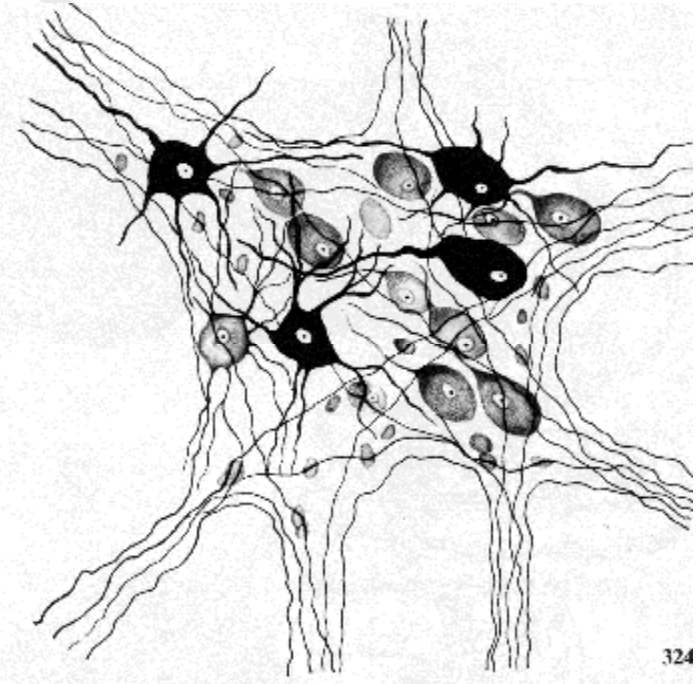
Nuclear nerve center is called ganglion in PNS, and nuclear in CNS

SCREEN (PLAN) NERVE CENTER (C)

1. Neurons are situated regularly, by layers
2. There are predominant a processes of divergence
3. There are functionally different types of neurons/

**A****B****C**

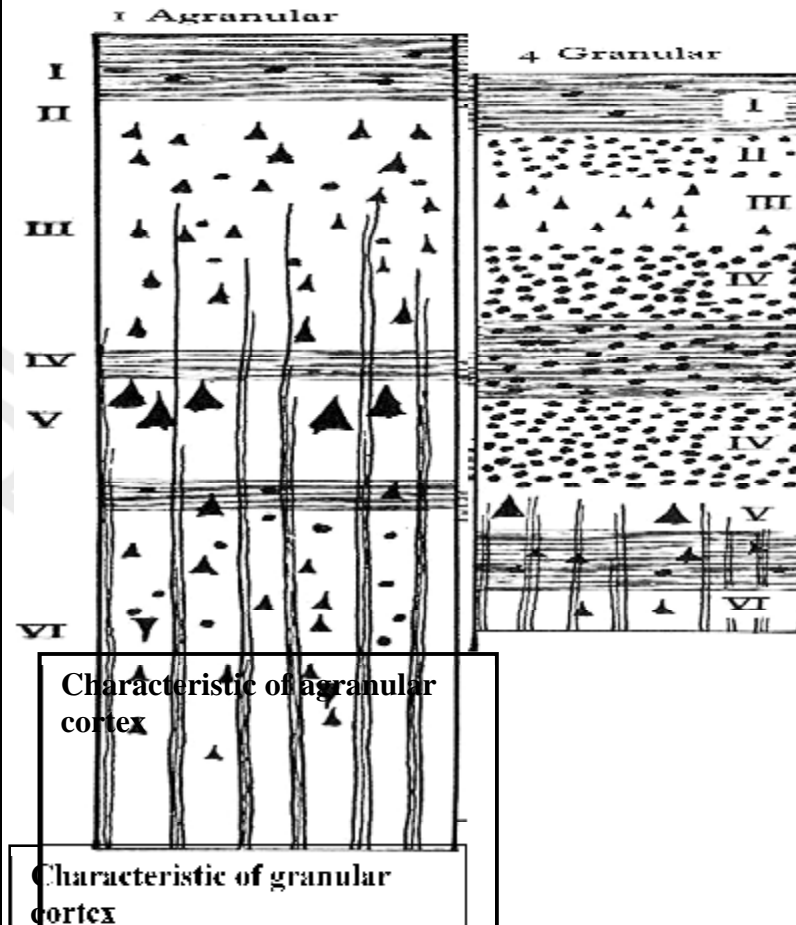
Task 86.	REFLEX ARCHES		
<p>REFLEX ARC is the chain of neurons and consists of</p> <ol style="list-style-type: none"> 1. Receptor (dendrite of sensory neurons) 2. Afferent neurons 3. Associative neurons 4. Efferent neurons 5. Efferent nerve endings (motor end plate). 	A	B	C
<p>Draw and designate:</p> <p>A – somatic reflex arch, B – sympathetic, C- parasympathetic reflex arches</p> <p>1 – sensory nerve ending; 2 – nerve-muscular spindle; 3 – sensory neuron of the spinal ganglion; 4 – intercalated multipolar neuron; 5 – motoneurons; 6– motor nerve endings, 7 – intercalated multipolar neuron of the lateral corn nucleus; 8 – efferent multipolar neuron (Dogel I type); 10 – preganglion fibres (in red); 11 – postganglion fibres (in blue);</p>			

<p>Task 87. CEREbroSPINAL GANGLION</p> <p>Staining <i>Hematoxylin-eosin</i> Magnification 400^x</p> <p>Draw and designate:</p> <p>1 – pseudounipolar neurocyte; 2 – blood capillaries; 3 – oligodendroglial nuclei.</p> <p>–</p>	<p>Task 88. PERIPHERAL NERVE</p> <p>Staining <i>Hematoxylin-eosin</i> Magnification 400^x</p> <p>Draw and designate:</p> <p>1 – bundles of nerve fibers; 2 – endoneurium; 3 – perineurium; 4 – epineurium; 5 – adipose cells.</p>	<p>Task 89. VEGETATIVE NERVOUS SYSTEM GANGLION</p> <p>Staining Impregnation with silver Magnification 400^x</p>  <p>324</p>
<p>Correct tasks No _____</p> <p>The tasks are completed</p> <p>Lecturer _____</p> <p>Date _____</p>		<p>Designate</p> <p>1 – long-axon nerve cell (Dogel) type</p> <p>2 – equal length of processes nerve cell (Dogel 2)</p> <p>3 – nerve fibers</p> <p>4 – nuclei of glial cells</p>

Topic **NerVOUS SYSTEM. CENTRAL NERVOUS SYSTEM**

9. Embryonal development of the brain
10. Cerebellum. Structure and functional characteristics. Neuronic ensembles of the cerebellar cortex as a screening center.
11. Brain. Cerebral hemispheres, sources of embryonic development. Histogenesis. Neuronic organization of the cerebral hemispherical cortex. Cyto- and myeloarchitectonics. Conception of modules and columns. Localization of functions in the cortical centers
12. Brainstem. Sources of development. Grey and white matter. Organization principles of ascending and descending passageways. Medulla, nuclei. Reticular formation: structure and functions

Task 90. TYPE OF CORTEX CEREBRAL HEMISPHERES



Correct tasks No _____

The tasks are completed

Lecturer _____

Date _____

Task 93.

CROSS SECTION OF THE CEREBRAL GYRUS

Staining
Magnification.

Impregnation with silver
400^x

Draw and designate

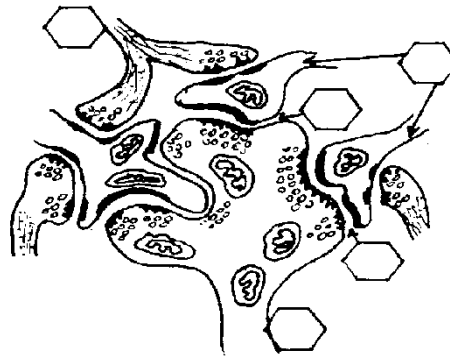
I – molecular layer: 1 — basket cell; 2 — stellate cell; 3 — dendrite Purkinje cell; 4 — climbing fibers; 5 — parallel fibers;

II – ganglionic layer: 6 — Purkinje cell bodies; 7 — baskets of nerve fibres;

III – granular layer: 8 — nuclei of granule-cells and Golgi's cells; 9 — mossy fiber;

Task 94.

CEREBELLAR GLOMERULUS



Color and designate

1 – the rosette of mossy fibers
(brown);

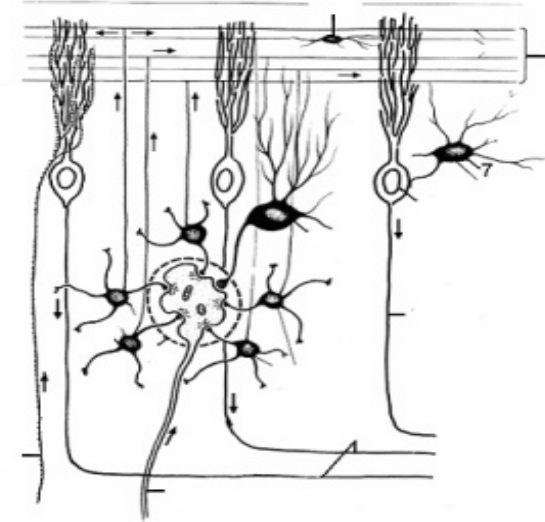
2 – dendrites of granule cells (green)

3 – the axon of Golgi cells;

4 – exiting axo-dendretic synapse ;

5 – inhibition synapse

**Task 95. INTERACTION BETWEEN
NEURONS AND AFFERENT FIBRES IN
NEURON ENSEMBLES OF CEREBELLAR
CORTEX (after J. Eckls)**



Designate

1 – Purkinje cell ;

2 – basket cell ;

3 – stellate cell ;

4 – granule cell;

5 – Golgi cell ;

6 – climbing fiber ;

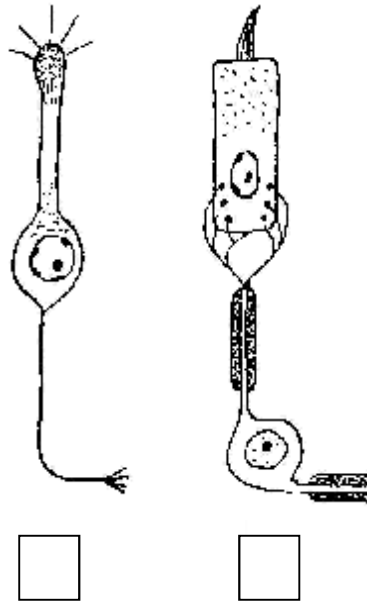
7 – mossy fiber ;

8 – collaterals of Purkinje cell axons;

9 – parallel fibers of molecular layer;

Topic: SENSE ORGANS	
<p>1. Sense organs. General morphological and functional characteristics. Conception of analyzer, its structure.</p> <p>2. Classification, structure and cytophysiology of receptor cells.</p> <p>3. The organ of smell: structure, sources of development, cytophysiology of neurosensory receptor cells.</p> <p>4. The organ of vision. Sources of development and basic stages of embryogenesis.</p> <p>5. The main functional apparatuses of the eye. Structure of the refractive and accommodative apparatuses of the eye ball. Their age-specific changes.</p> <p>6. The receptive apparatus: development, structure, and adaptation of the retina to the level of light. Specialized regions of the retina. Types of neurosensory receptor cells.</p> <p>7. The organ of a taste: source of development, structure, cytophysiology of taste receptor cells.</p> <p>8. The organ of hearing. Morphological and functional characteristics. Sources of development, structure, cytophysiology of sensoepithelial receptor cells of the spiral organ.</p> <p>9. The organ of equilibrium. Sources of development, structure, functions. Morphological and functional characteristic of sensoepithelial receptor cells.</p> <p>284.</p> <p>285.</p> <p>286. Definition of the “Sense organ”:</p> <p>287.</p> <p>288.</p> <p>289.</p>	<p>290.</p> <p>291. The main functional apparatuses of the eye:</p> <p>292.</p> <p>293. 1 – refractive apparatus</p> <p>294.</p> <p>295. includes:</p> <p>296.</p> <p>297.</p> <p>298.</p> <p>299.</p> <p>300. 2 – accommodative apparatus</p> <p>301.</p> <p>302. includes:</p> <p>303.</p> <p>304.</p> <p>305.</p> <p>306.</p> <p>307. 3 – receptive apparatus</p> <p>308.</p> <p>309. includes:</p>

310. **Task 96. RECEPTOR CELLS**

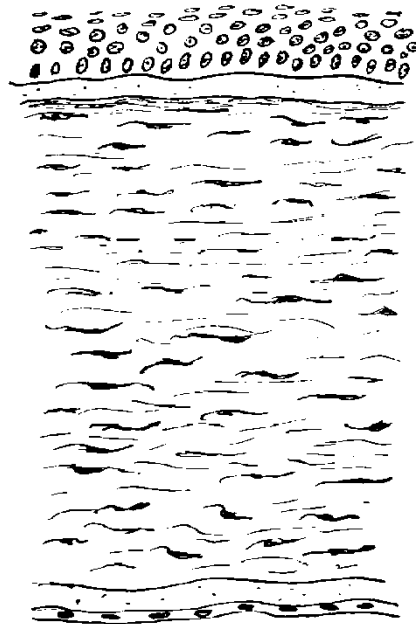


311.
312.

Designate neurosensory (1) and sensoepithelial (2) cells. Indicate their location:

1. 1 –
- 2 –
2. 1 –
- 2 –
- 3 –

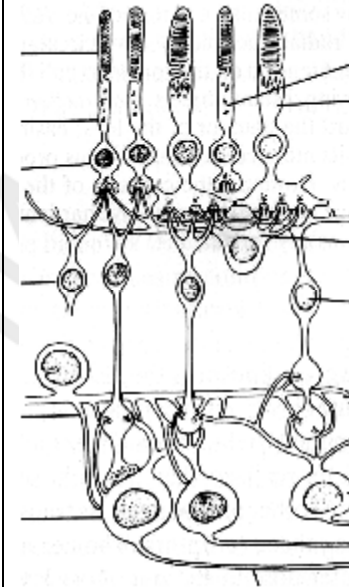
Task 97. CORNEA
Staining Hematoxylin-eosin
Magnification 80^{\times} , 400^{\times}



Designate:

- 1 – nonkeratinized stratified squamous epithelium;
- 2 – anterior basement membrane (Bowman's membrane);
- 3 – substantia propria of the cornea;
- 4 – posterior basement membrane (Descemet's membrane);
- 5 – posterior epithelium of the cornea (endothelium).

Task 98. POSTERIOR WALL OF EYE
Staining Hematoxylin-eosin
Magnification 80^{\times} , 400^{\times}



Draw eye wall sections (in the dark ness and in the light) and designate in the picture and in the diagram:

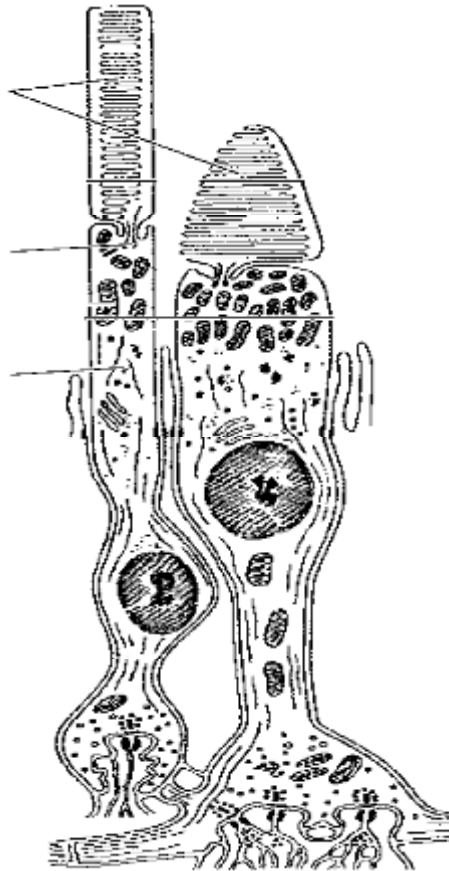
I – choroid:

3 – blood vessels; 4 – pigmentary tissue;

II – retina:

5 – pigment epithelium; 6 – layer of rods and cones; 7 – external limiting membrane; 8 – outer nuclear layer; 9 – outer plexiform layer; 10 – inner nuclear layer; 11 – inner plexiform layer; 12 – layer of ganglion cells; 13 – nerve fiber layer; 14 – internal limiting membrane.

Task 99.
ULTRASTRUCTURE OF ROD AND CONE



313.

314. Designate:

315. I – rod

II - cone

316. 1 – outer segments;

6 – cilium;

317. 2 – inner segment;

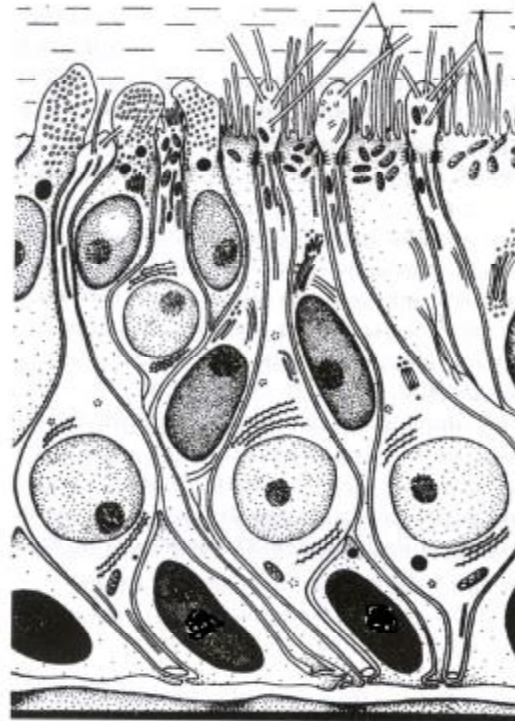
7 – synapses with
bipolar cells.

318. 3 – mitochondria;

319. 4 - nuclei;

Task 100.
OLFACTORY AREA OF THE NASAL
CAVITY

320.



321.

322. Designate:

323.

324. 1 – olfactory cell;

325. 2 – apexes with cilia;

326. 3 – supporting cells;

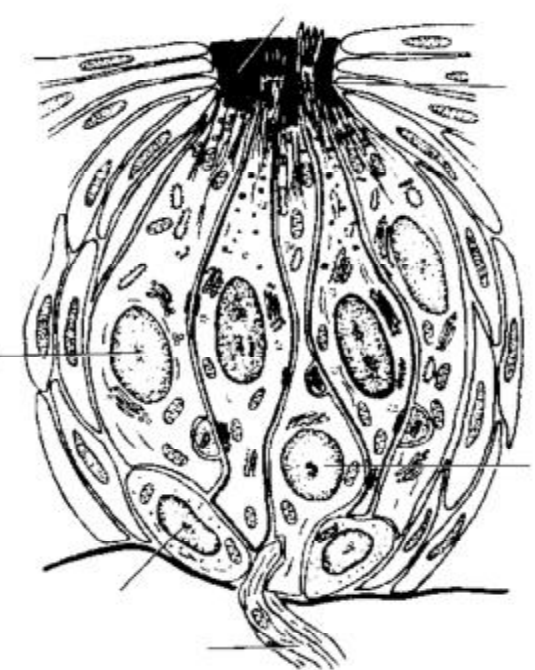
327. 4 – microvilli;

328. 5 – basal cells.

329.

330.

Task 101.
SCHEME OF A TASTE BUD



Designate:

331. 1 – taste pore;

332. 2 – microvilli;

333. 3 – taste cell;

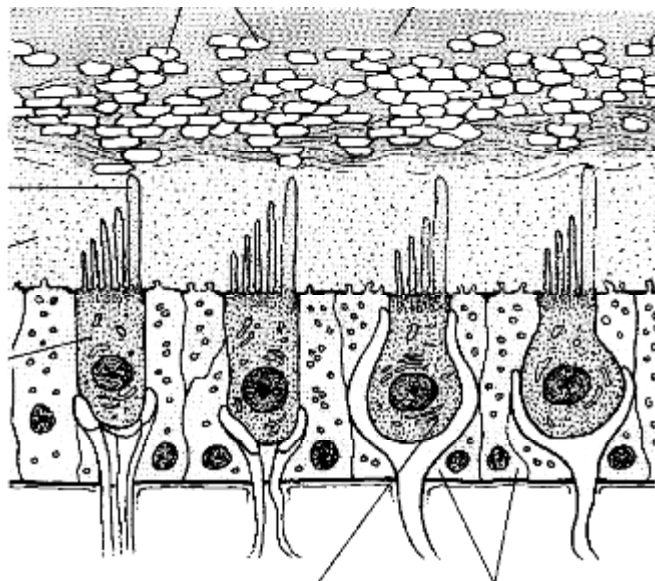
334. 4 – supporting cell;

335. 5 – basal cell;

336. 6 – afferent nerve fiber.

Task 102. SCHEME OF A MACULA
WITHIN THE UTRICLE

337.



338.

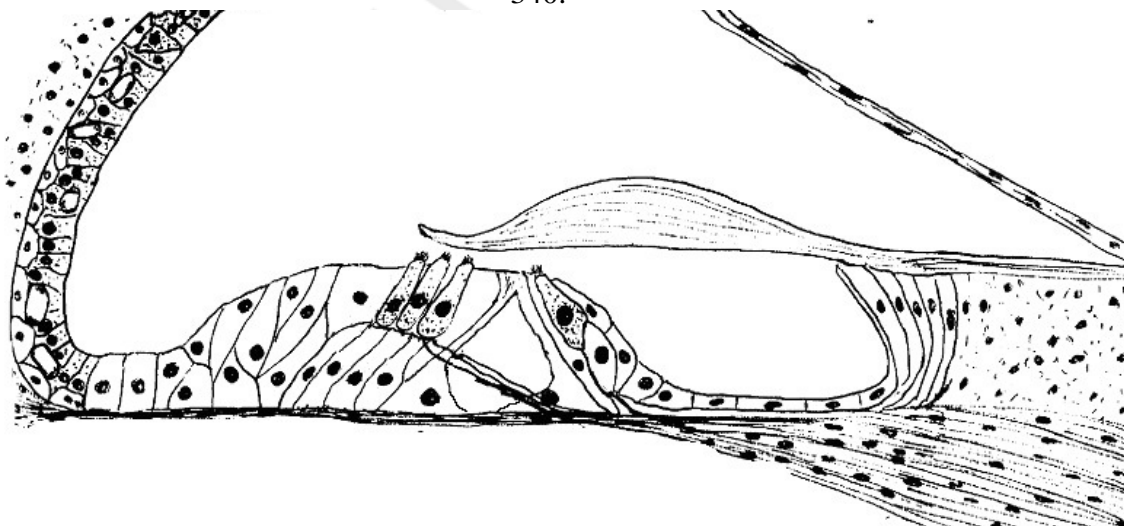
Designate:

- 1 – type I hair (sensory) cell;
- 2 – type II hair cell;
- 3 – supporting epithelial cells;
- 4 – kinocilium;
- 5 – nerve endings;
- 6 – otolithic membrane;
- 7 – otoconia;
- 8 – endolymph.

Task 103. SPIRAL ORGAN
Staining Hematoxylin-eosin
Magnification 400^x

339.

340.



341.

Designate:

- 1 – outer hair cells;
- 2 – inner hair cells;
- 3 – outer supporting cells;
- 4 – inner supporting cells;
- 5 – outer pillar cell;
- 6 – inner pillar cell;
- 7 – tunnel;
- 8 – tectorial membrane;
- 9 – basilar membrane;
- 10 – vestibular membrane;

- 11 – stria vascularis epithelium;
- 12 – capillaries;
- 13 – spiral ligament.

342.

16. Correct tasks №№ _____

17. Teacher

Date «____» _____ .

Topic integumentary system (skin)

343. Integumentary system (the skin). Morphological and functional characteristics. Sources of development.
344. Skin. Morphological and functional characteristics of thick skin epidermis (that of the palms and feet). Keratinization and regeneration of skin epidermis.
345. Morphological and functional characteristics of skin epidermis melanocytes and dendrocytes and their development.
346. Structure and function of the connective tissue basis of the skin (dermis). Organization peculiarities of papillary and reticular tissue layers. Skin receptors.
347. Skin glands. Morphological and functional characteristics of eccrine and apocrine sweat glands. Topographic, structural and secretory peculiarities of sebaceous glands.
348. Development and structure of hair. Hair types. Hair growth and replacement. Nail structure.
349. Age- and sex-related peculiarities of the skin.

Skin is the largest organ of the body - $1.5 - 2 \text{ m}^2$.

Task 104**ORIGIN AND FUNCTIONS EPIDERMIS CELLS**

(fill in the table)

Type of epidermis cell	Source of development	Function
Keratinocyte		Synthesis of proteins 1. 2. 3.
Melanocyte		
Langerhan's cell		
Merkel's cell		
Greanstain cell		
Lymphocyte		

Task 105. SKIN OF THE FINGER
Staining: Hematoxylin-eosin
Magnification: 400^x

Task 106. TYPES OF SKIN EPIDERMIS CELLS



Desig

I – keratinocytes:

- 1 – basal cell;
- 2 – spinous cell;
- 3 – granular cell;
- 4 – corneocyte.

II – melanocyte:

- 5 – melanosomes of melanocytes;

III – dendrocytes:

- 6 – tennis racquet-shaped granules.

Paint and designate:

I – epidermis:

- 1 – stratum basale;
- 2 – stratum spinosum;
- 3 – stratum granulosum;
- 4 – stratum lucidum;
- 5 – stratum corneum.

II – dermis:

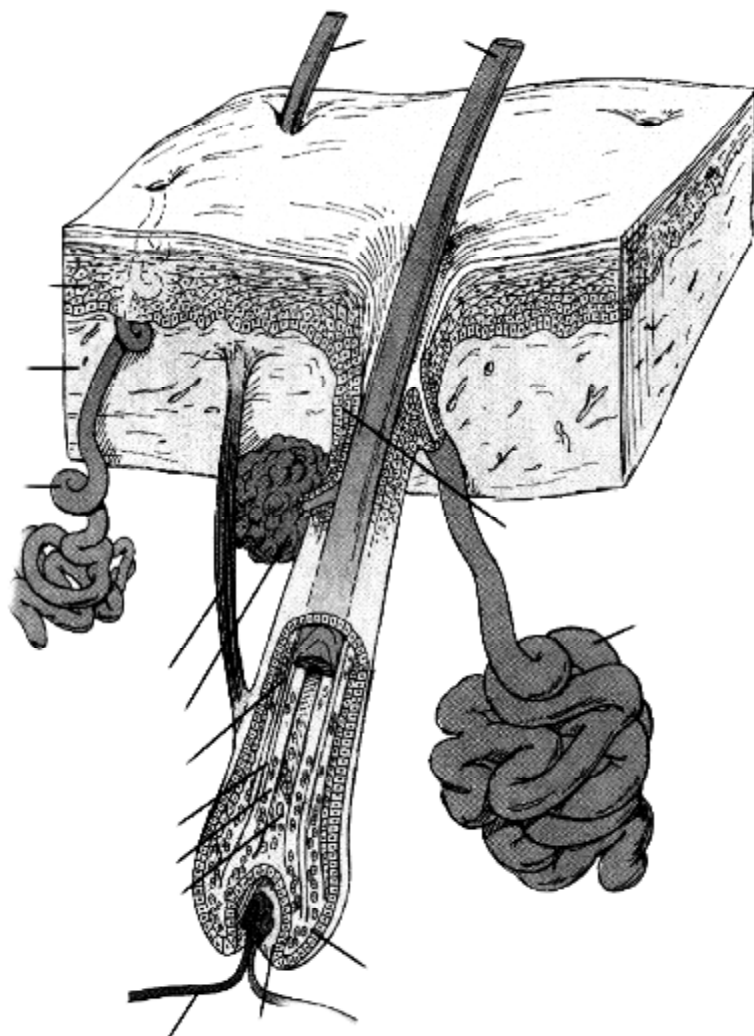
- 6 – papillary layer;
- 7 – reticular layer;
- 8 – sweat glands;
- 9 – blood vessels.

III–hypodermis.

Task 107. SKIN GLANDS

Types of glands	Structural type	Type of secretion	Location in skin
1. Sweat glands a) merocrine b) apocrine			
2. Sebaceous			
3. Mammary			

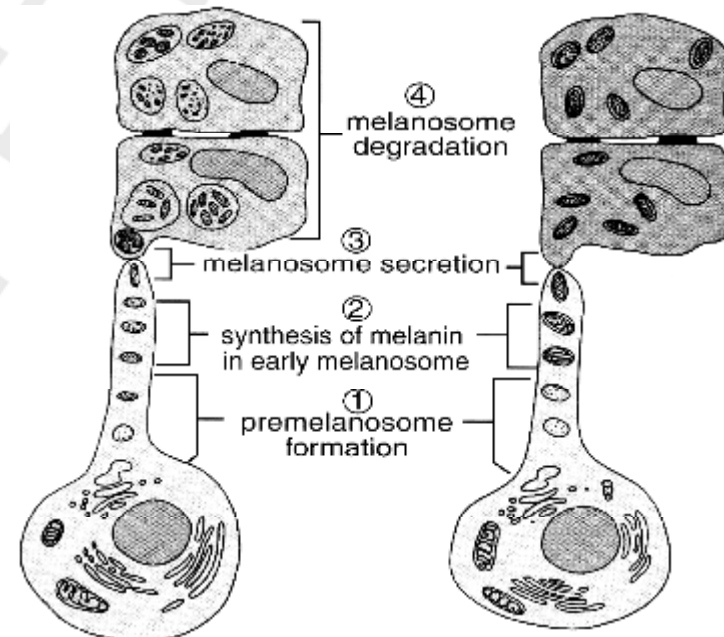
Task 108. SKIN AND ITS APPENDAGES (SCHEME)



Designate:

- 1 – epidermis;
- 2 – dermis;
- 3 – cortex of the hair;
- 4 – medulla of the hair;
- 5 – hair cuticle;
- 6 – internal root sheath;
- 7 – external root sheath;
- 8 – connective tissue sheath;
- 9 – hair bulb;
- 10 – hair papillae;
- 11 – sebaceous gland;
- 12 – arrector pili muscle;
- 13 – eccrine sweat gland;
- 14 – apocrine sweat gland;
- 15 – blood vessels.

Task 109. FORMATION OF MELANIN PIGMENT AND SECRETION IT INTO KERATONOCYTES



Designater:

- 1- keratinocytes,
- 2- melanocytes

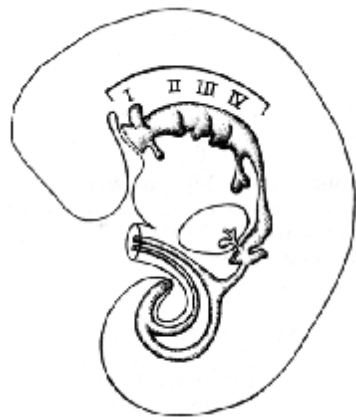
Correct tasks №№ _____

Teacher _____

Date _____

Topic Digestive system: organs of THE oral cavity, oesophagus	
<p>Digestive system: development sources and their derivatives, general structure (membranes and layers), functions.</p> <p>Oral cavity, structural organization of its mucous membrane and function. The lip, gum, cheek, hard and soft palate. Their histological and physiological features.</p> <p>Structure of the tongue. Characteristics of tongue papillae. Taste buds. Teeth. Sources and basic stages of development. Microscopic structure of dentine, enamel, cementum and pulp. Tooth supporting structures.</p> <p>Age-related changes of the oral mucous membrane.</p> <p>Oesophagus. Sources and features of development. Oesophageal membrane structure and their topographic features. Functions of the oesophagus.</p>	<p>Organs of oral cavity:</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. 7. <p>The structural peculiarities of the oral cavity mucosa:</p> <p><i>Epithelium-</i></p> <ul style="list-style-type: none"> - is stratified squamous keratinized (gingiva, hard palate) or nonkeratinized (soft palate, lips, cheeks, floor of the mouth) - has a large thickness (200-600 µm) - has a high capability of regeneration
<p>Call the main development stages of teeth:</p> <p>1 _____</p> <p>2 _____</p> <p>3 _____</p>	<p>Lamina propria of the mucosa</p> <ul style="list-style-type: none"> - forms papillae, bulging in epithelium - contain glands and lymphatic tissue <p>The muscularis mucosa</p> <ul style="list-style-type: none"> - is often absent

Task 118
DEVELOPMENT SOURCES OF
DIGESTIVE SYSTEM



Colour:

foregut– in **blue**;
midgut– in **yellow**;
hindgut – in **red**

Designate:

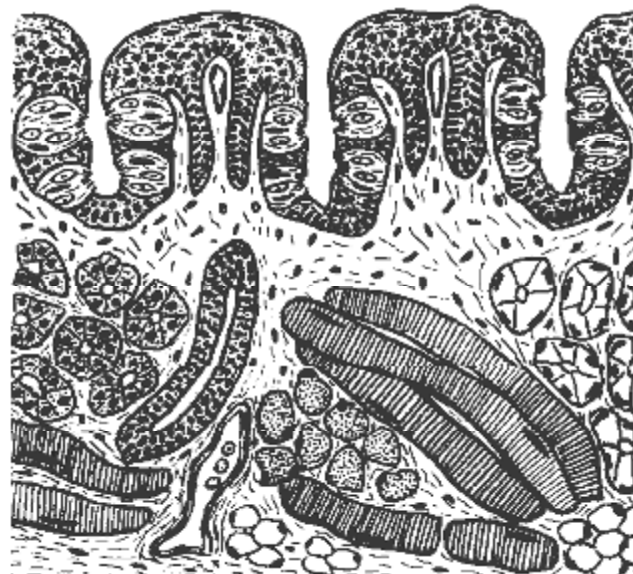
- 1 – oral groove;
- 2 – oropharyngeal membrane;
- 3 – cloacal membrane;
- 4 – pharyngeal recesses;
- 5 – thyroid gland rudiment;
- 6 – oesophageal rudiment;
- 7 – respiratory system rudiment;
- 8 – stomach rudiment;
- 9 – hepatic diverticulum;
- 10 – pancreatic rudiment;
- 11 – yolk sac;
- 12 – allantois.

Task 119
TONGUE OF THE RABBIT.
FOLIATE PAPILLAE

Staining

Magnification 80^x, 400^x

Hematoxylin-eosin



Designate and colour after studying the preparation:

I. Mucous membrane;

- 1 – stratified nonkeratinized squamous epithelium;
- 2 – taste buds in epithelium;
- 3 – lamina propria of the mucous membrane;
- 4 – primary connective-tissue papilla;
- 5 – secondary connective-tissue papillae;

II. Muscular coat (muscular body):

- 6 – striated muscles of the tongue;
- 7 – secretory portions of the glands;
- 8 – excretory duct of salivary gland ;
- 9 – fat (adipose) cells;
- 10 – blood vessels.

Task 120

TOOTH STRUCTURE AND
TISSULAR COMPOSITION

Designate and
complete:

1 – crown, consisting of:

- a)
- б)
- в)

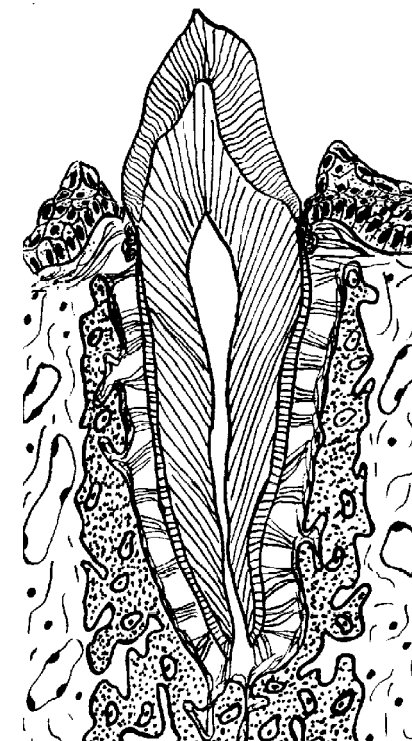
2 – neck of the tooth;

3 – root, consisting of

- a)
- б)
- в)

Dental ligaments
(periodontal membrane),
consisting of:

- 4 – gum (gingival);
- 5 – alveolar bone;
- 6 – periodontium;
- 7 – cementum.



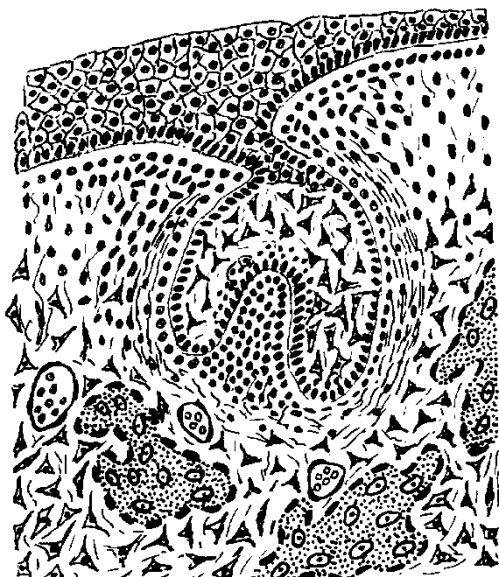
Colour the tissues of the tooth in the scheme:
epithelial tissue– in **green**, osseous tissue – in **blue**, fibrous
connective tissue – in **yellow**.

	tissue	regeneration degree
enamel		
dentine		
cementum		
pulp		
periodontium		

Task 121

TOOTH
DEVELOPMENT.
EARLY STAGE
Hematoxylin-eosin
80^x, 400^x

Staining
Magnification



Designate:

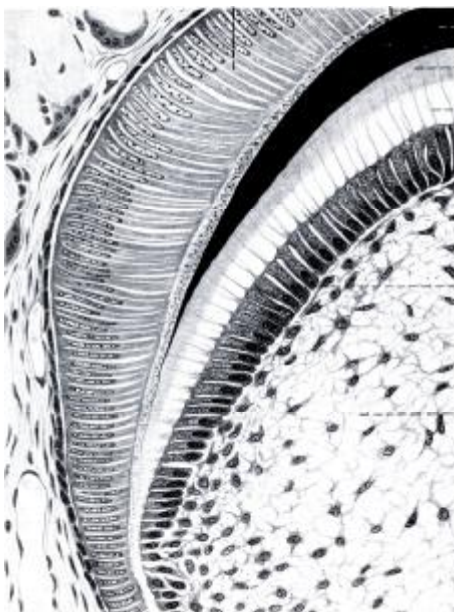
- 1 – oral epithelium;
- 2 – mesenchyma;
- 3 – blood vessels;
- 4 – dental lamina;
- 5 – external enamel epithelium;
- 6 – internal enamel epithelium;
- 7 – pulp of enamel organ;
- 8 – dental papilla;
- 9 – dental sac;
- 10 – dental alveolar rudiment.

Task 122

TOOTH DEVELOPMENT. LATE STAGE.
Hematoxylin-eosin

Staining

Magnification 80^x, 400^x



- 1 – external enamel epithelium;
- 2 – enameloblasts;
- 3 – enamel;
- 4 – odontoblasts;
- 5 – predentine;
- 6 – dentine;
- 7 – dentinal canals;
- 8 – pulp;
- 9 – blood vessels.

Complete the table and write down dental tissues developing:

1. From enamel organ: – from internal layer:	
– from external layer and pulp:	
2 From dental bulb.:	1. 2.
3. From dental sac:	1. 2.

Task 123
Staining
Magnification

400^x

CROSS- SECTION OF THE OESOPHAGUS Hematoxylin-eosin

Draw and designate:

I – mucous membrane:

- 1 –stratified nonkeratinized squamous epithelium;
- 2 – excretory ducts of proper glands;
- 3 – muscular lamina;

II – submucous membrane:

- 4 – proper glands;

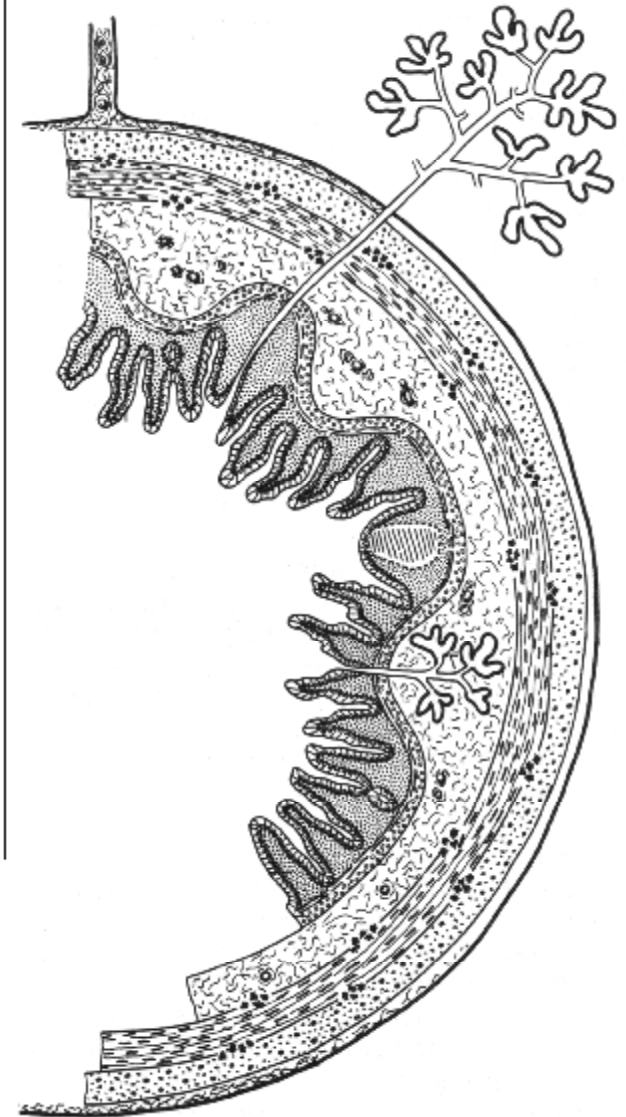
III – muscular layer:

- 5 – a) circular and b) longitudinal layers;
- 6 – inermuscular ganglion;

IV – adventitial membrane:

- 7 – connective tissue;
- 8 – blood vessels;
- 9 – nerve fibers.

Task 124 DIGESTIVE TUBE (scheme)



Designate:

I – mucous membrane:

- 1 – epithelium;
- 2 – lamina propria;
- 3 – lymphatic follicle in lamina propria;
- 4 – muscular lamina;
- 5 – crypts;
- 6 – villi;
- 7 – fold.

II – submucous membrane:

- 8 – complex glands.

III – muscular layer:

- 9 – external circular layer;
- 10 – external longitudinal layer;

IV – external layer.

- 11 – glands out of digestive tube.

Correct tasks №№ _____

The tasks are completed

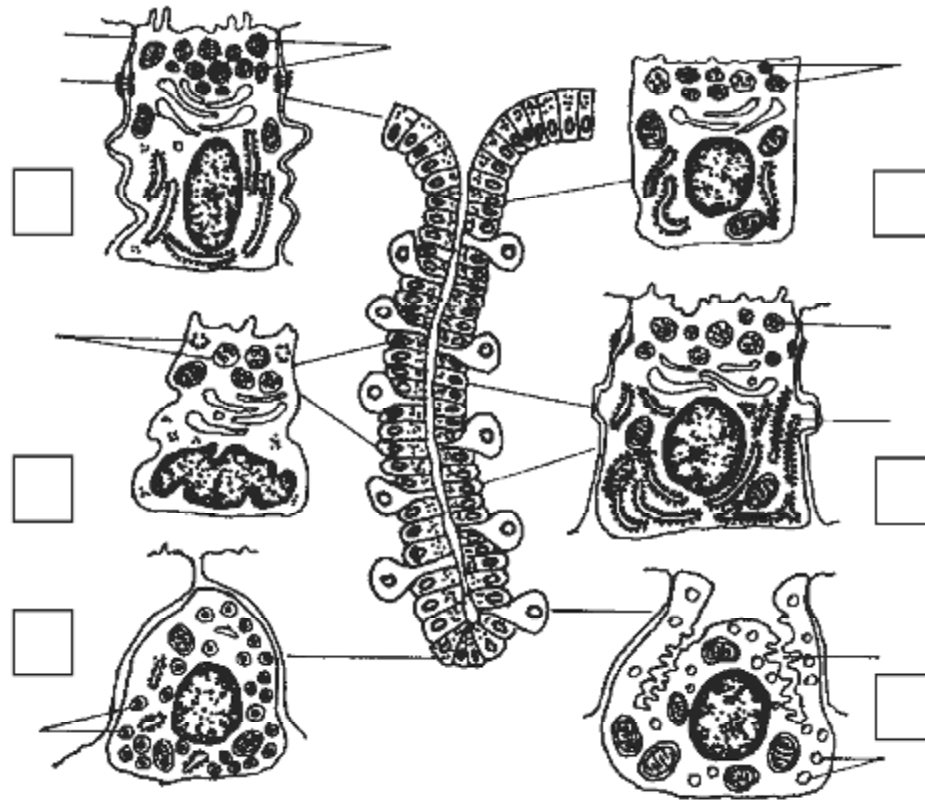
Teacher _____

Date _____

Topic DIGESTIVE SYSTEM (STOMACH, INTESTINES)	
<p>Stomach: sources of development, general characteristics of its membranes, functions.</p> <p>Morphological characteristics of different gastric parts: relief of gastric mucosa, glands (branching, character of secretion, cellular structure), peculiarities of muscular membrane.</p> <p>Main gastric glands: topography, characteristics of excretory duct and secretory portion (degree of branching, form), cellular structure (cell localization, micro- and ultramicroscopic structure, functions).</p> <p>Structural peculiarities of the gastric wall and its glands in the cardiac and pyloric regions.</p> <p>Structure and functions of the small and large intestines.</p> <p>Microscopic structure of small intestine villi, their functions. Ultramicroscopic structure and regeneration of the small intestine epithelium.</p> <p>Cavernous, membranous and intracellular digestion. Histophysiology of the “crypt- fillus” system.</p> <p>Structural peculiarities of the duodenal wall.</p> <p>Morphology of the large intestine wall.</p> <p>Structural peculiarities of the appendix.</p> <p>Endocrine system of digestive tract.</p> <p>Definition of the term “Digestion” _____</p> <p>_____</p> <p>_____</p>	<p>Write down the organs of digestive tract:</p> <p>I. Organs of alimentary canal</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 6. <p>II. Digestive glands</p> <ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> a) b) c) 2. 3.

Task 125 Staining Magnification	FUNDUS OF THE STOMACH Hematoxylin and congo-red 400 ^x	Task 126 Staining Magnification	PYLORIC PORTION OF THE STOMACH Hematoxylin-eosin 400 ^x
			<div data-bbox="1447 328 2042 1106" data-label="Image"> <p>A black and white micrograph showing a cross-section of the pyloric portion of the stomach. The image displays several gastric pits (fossae) of varying depths. At the base of these pits are the pyloric glands, which are coiled and branched. The glands are lined by a simple columnar epithelium. The surrounding tissue shows the muscular layers of the stomach wall, with some blood vessels visible in the submucosa.</p> </div> <p data-bbox="1361 1155 2065 1235"><i>Draw the mucous membrane with the terminal parts of pyloric glands and designate:</i></p> <ol data-bbox="1413 1241 1962 1378" style="list-style-type: none"> 1 – integumentary epithelium; 2 – longitudinal section of gastric fossae; 3 – cross-section of stomach fossae; 4 – terminal parts of pyloric glands;

Task 127 MUCOUS EPITHELIAL CELLS OF GASTRIC FUNDUS
(based on electron microscopic image)

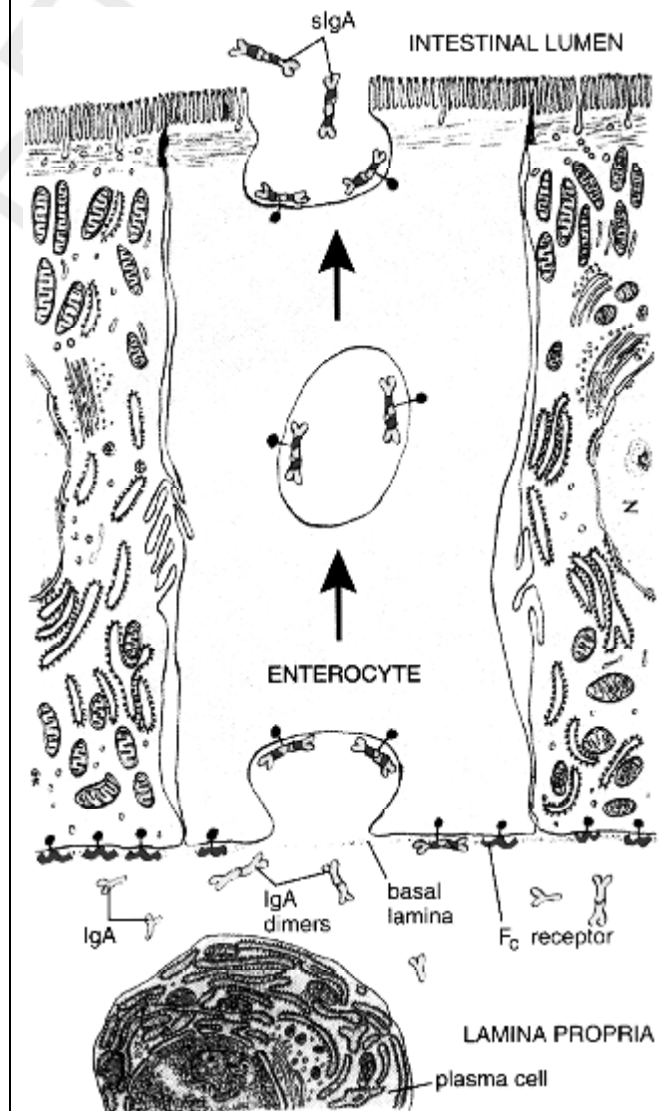


Designate:

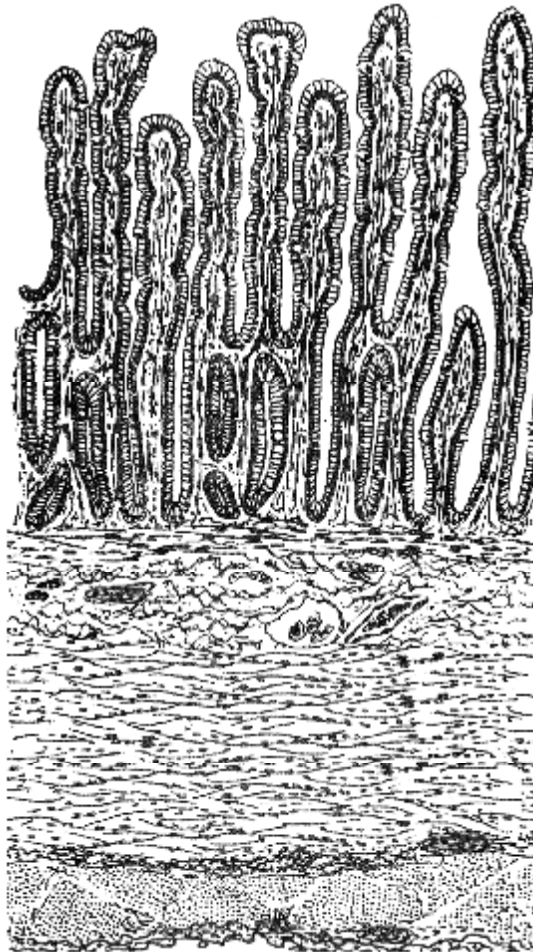
- I – superficial gastric epitheliocytes:**
 1 – granules of mucous secretion;
 2 – close contact;
II – cervical mucocyte:
 4 – secretory granules of different types;
III – basic exocrinocyte:
 5 – protein secretion granules;
 6 – granular endoplasmic reticulum;

- IV – mucocyte in the proper gland body:**
 7 – mucous secretion granules;
V – parietal exocrinocyte:
 8 – intracellular secretory tubule;
 9 – vacuoles;
VI – gastrointestinal endocrinocyte:
 10 – secretion granules.

Task 128 DIAGRAM OF IgA SECRETION AND TRANSPORT



Task 129 JEJUNUM (transverse section)
 Staining Hematoxylin-eosin
 Magnification 80^x, 400^x



Designate and colour affers studying the preparation:

I – mucous membrane:

- 1 – villi;
- 2 – crypts;
- 3 – limbic epitheliocytes;
- 4 – goblet cells;
- 5 – proper lamina of the mucous membrane;
- 6 – muscular lamina of the mucous membrane;

II– submucous layer:

- 7 – nerve plexus node (Meisner's node);
- 8 – blood vessels;

III – Muscular layer:

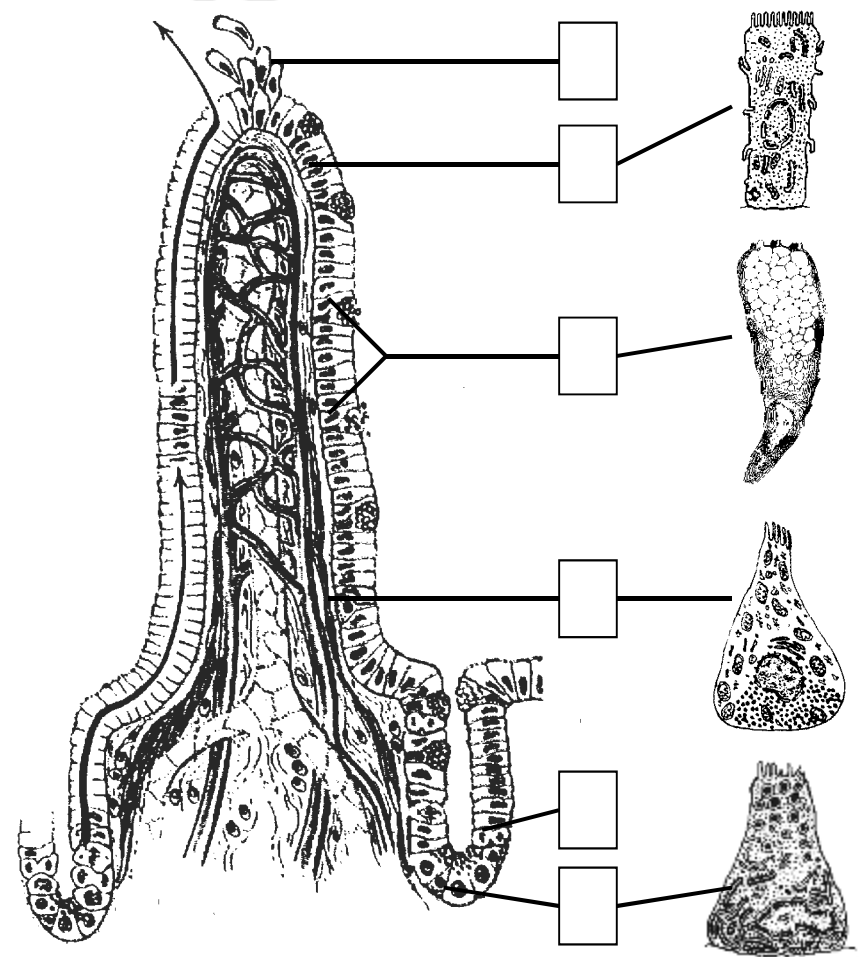
- 9 – internal circular layer;
- 10 – external longitudinal layer;
- 11 – intermuscular nerve plexus node (Auerbach's node);

IV – serous coat:

- 12 – connective tissue lamina;
- 13 – mesothelium.

Task 130

“CRYPT-VILLUS” SYSTEM



Designate:

- 1 – stem cell of intestinal epithelium (mitosis);
- 2 – border enterocyte;
- 3 – goblet cell;
- 4 – Panet's cell;

- 5 – endocrine cell;
- 6 – blood capillary villus;
- 7 – lymphatic capillary;
- 8 – aged enterocyte exfoliation (peeling).

Task 131
Staining
Magnification

DUODENUM
Hematoxylin-eosin
80^x, 400^x

Draw and designate:

I – mucous membrane:

- 1 – villus;
- 2 – crypts;
- 3 – single-layer cylindrical limbic epithelium;
- 4 – proper lamina of mucous membrane;
- 5 – muscular lamina of mucous membrane;

II – submucous layer:

- 6 – terminal parts of duodenal glands;

III – muscular layer:

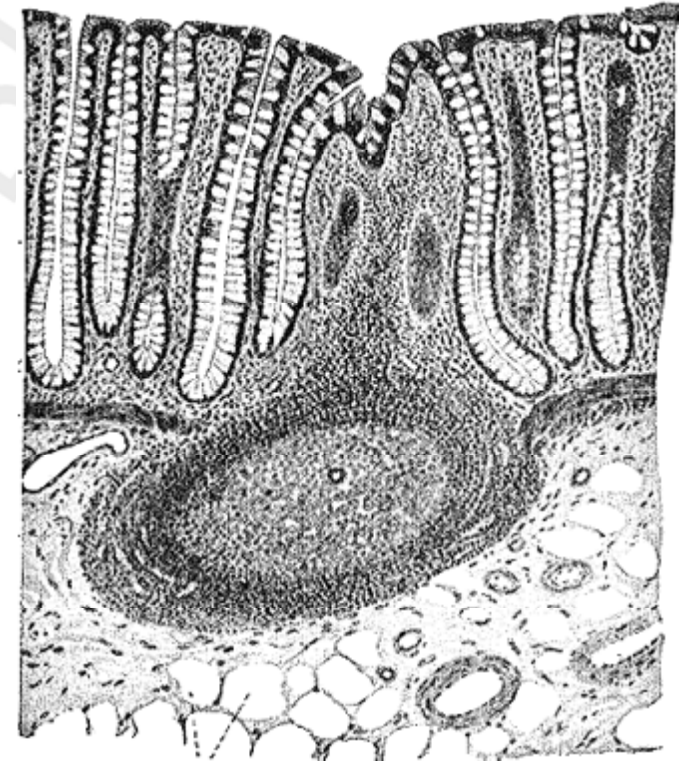
- 7 – circular layer;
- 8 – longitudinal layer;
- 9 – nerve plexus node;

IV – serous / adventitial coat:

- 10 – connective tissue lamina;
- 11 – mesothelial cell (in case of serous membrane).

Task 132
Staining
Magnification

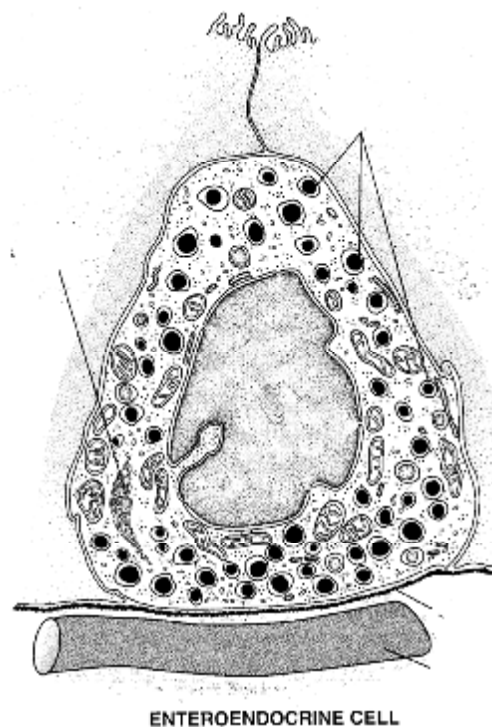
ТОЛСТАЯ КИШКА
Hematoxylin-eosin
400^x



Draw the mucous membrane and designate:

- 1 – crypts;
- 2 – limbic cells;
- 3 – goblet cells;
- 4 – proper lamina of the mucous membrane;
- 5 – muscular lamina of the mucous membrane;
- 6 – lymph nodule.

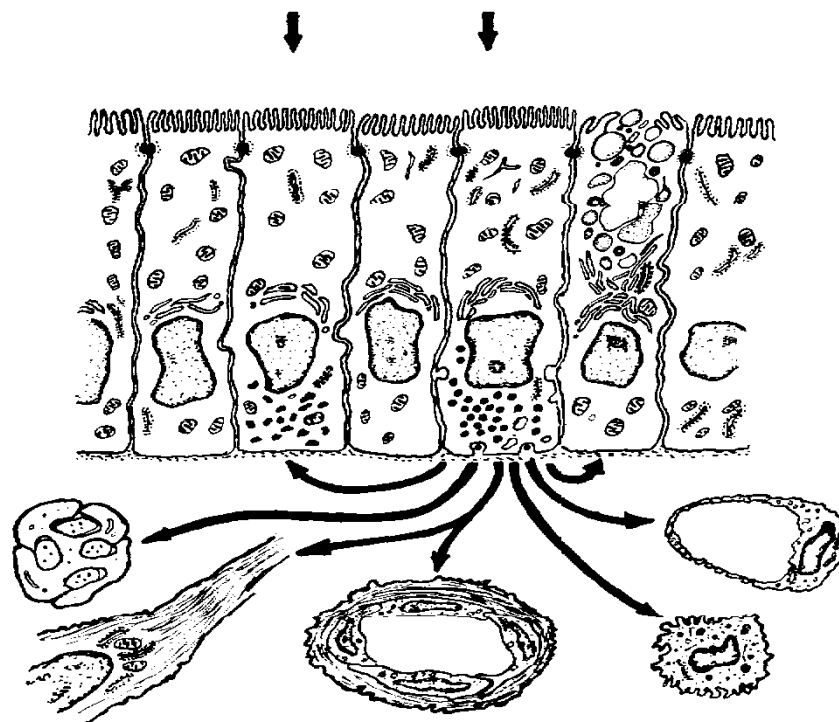
Task 133 ENDOCRINE CELL OF
THE SMALL INTESTINE



Designate:

- 1 – lamina basalis;
- 2 – capillary;
- 3 – nucleus;
- 4 – secretory granules;
- 4 – Golgi apparatus;
- 5 - mitochondria;

Task 134 **HORMONAL ACTIVITY OF INTESTINAL ENDOCRINOCTES**



Designate:

- 1 – enteroendocrine cells; 2 – adjacent enterocytes; 3 – nerve fibers; 4 – smooth muscles; 5 – arterioles; 6 – connective tissue cells; 7 – capillaries; 8 – goblet cell.

Task 135 Complete the table:		THE LINING EPITHELIUM AND GLANDS IN THE DIFFERENT PARTS OF ALIMENTARY CANAL	
	The part of the alimentary canal	The lining epithelium	The alimentary glands and its localized
1.	Oral cavity		
2.	Esophagus		
3.	Stomach		
4.	Small intestine		
5.	Large intestine		

Correct tasks № _____

Lecturer _____

Date « ____ » _____ .

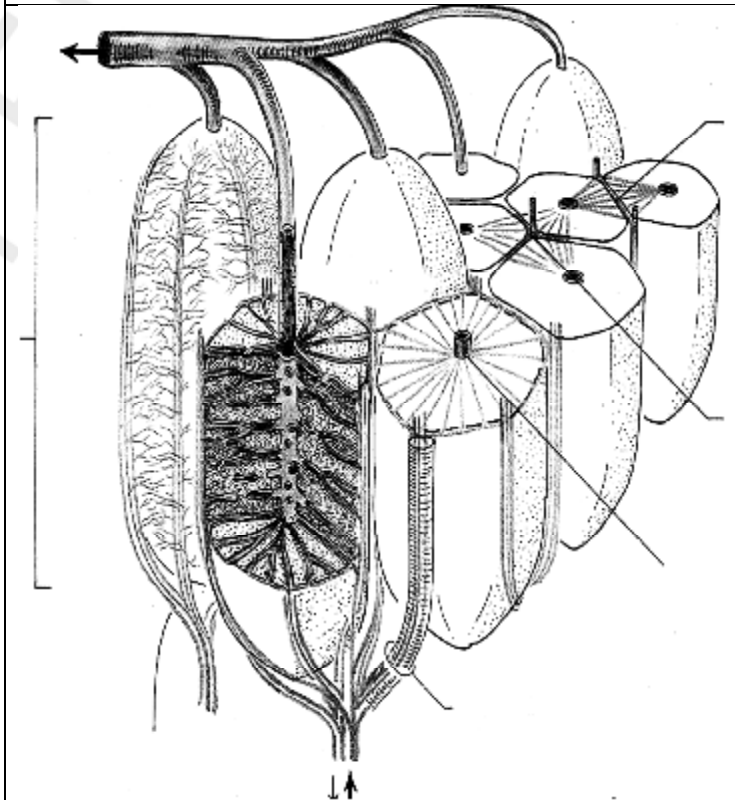
Topic digestive system: liver, pancreas and LARGE salivary glands

1. Development sources of the liver. Functions of the liver.
2. Structure of a classical hepatic lobe. The concept of portal lobe and hepatic acinus.
3. Bile ducts: structure of bile ducts and gallbladder.
4. Functions of the exocrine and endocrine portions of the pancreas/.
5. The pancreas, structure of the exocrine portion of the pancreas: lobes, terminal parts, excretory ducts.
6. Pancreatic islets. Structure of the endocrine portion of the pancreas..
7. Large salivary glands. Sources of development, structure, functions.

It is recommended to review:

Structure of exocrine and endocrine glands.

Task 136. STRUCTUREAL SCHEME OF HEPATIC PORTAL LOBE AND ACINUS



Designate:

- 1- classic hepatic lobe
- 2- portal lobe
- 3- acinus
- 4- portal canal (triads)
- 5- central vein

Task 137. BLOOD SUPPLY the LIVER

SYSTEM of BLOOD SUPPLY TO THE LIVER

- 1 –
- 2 –
- 3 –

SYSTEM of CIRCULATION WITHIN THE LIVER

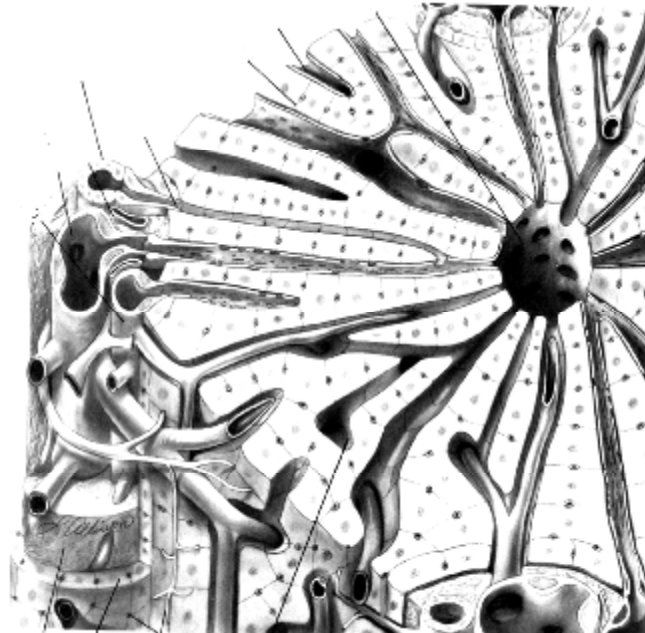
- 1 –

SYSTEM of BLOOD LEAVING THE LIVER

- 1 –
- 2 –

- 3 –
- 4 –

Task 138. SCHEME OF HEPATIC LOBULAR BLOOD SUPPLY



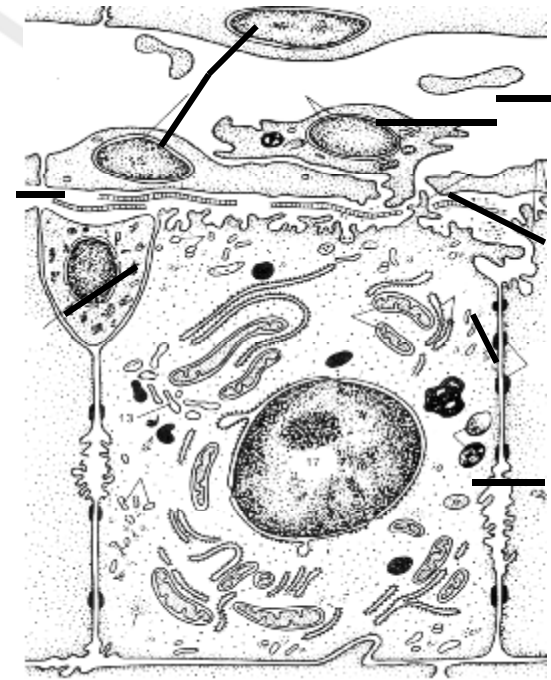
Designate:

- 1 – interlobular vein;
- 2 – interlobular artery;
- 3 – interlobular bile duct and capillaries;
- 4 – central vein.

Colour:

venous flow – in **blue**
 arterial flow – in **red**,
 bile ducts – in **green**

Task 139. ULTRAMICROSCOPIC STRUCTURE OF THE LIVER.



Designate:

- 1 – hepatic sinusoid
- 2 – endothelial cells
- 3 – macrophage
- 4 – space of Disse
- 5 – reticular fibers
- 6 – Ito cell
- 7 – tight junction(zonula occludens)
- 8 – bile canaliculus

Task 140. LIVER OF THE PIG
 Staining: Hematoxylin-eosin
 Magnification: 80^x, 400^x



Designate:

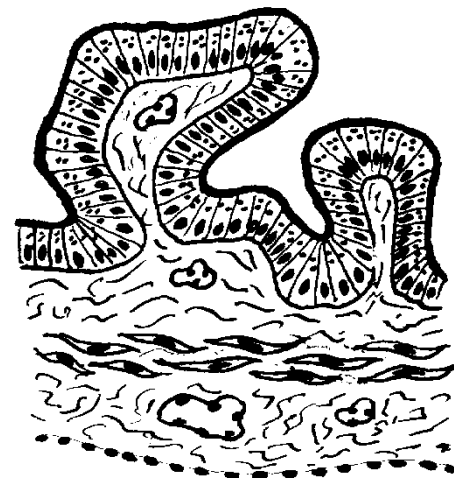
- 1 – capsule;
- 2 – interlobular connective tissue;
- 3 – interlobular artery;
- 4 – interlobular vein,
- 5 – interlobular bile duct;
- 6 – hepatic lobe;
- 7 – central vein;
- 8 – interlobular sinusoid capillary.

Task 141 HUMAN LIVER
 Staining: Hematoxylin-eosin
 Magnification: 80^x, 400^x

Draw and designate:

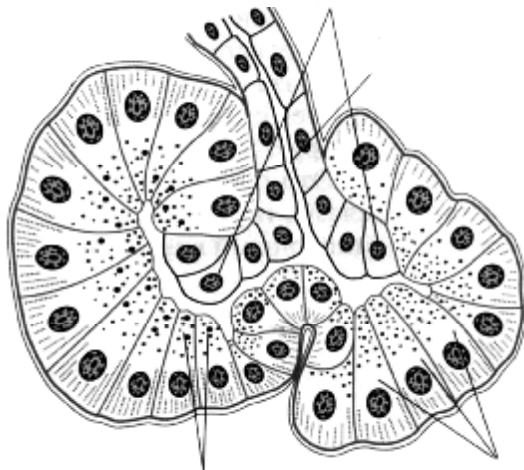
- 1 – interlobular artery;
- 2 – interlobular vein;
- 3 – interlobular bile duct;
- 4 – central vein;
- 5 – plates of hepatocytes;
- 6 – interlobular sinusoid capillary;
- 7 – endothelial cells.

Task 142. SCHEME OF THE
 GALLBLADDER
 WALL



Designate:

- I – mucous membrane:**
 - 1 – epithelial cell
 - 2 – lamina propria;
- II – muscular membrane (coat);**
- III – serous membrane (coat):**
 - 3 mesothelium.

Task 143**SCHEME OF THE
PANCREATIC
ACINUS****Designate:**

1. intercalated duct;
2. centroacinar cells;
3. exocrine pancreatocyte;
4. secretory granules in zymogenic area;
5. homogenous area;

Task 144**PANCREAS****Staining:**

Hemoxilyn-eosin

**Magnificati
on.**80^x, 400^x**Colour and designate:**

- 1 – interlobular connective tissue;
- 2 – interlobular excretory duct;
- 3 – interlobular artery;
- 4 – interlobular vein;
- 5 – acinus:
- a) homogenous (basophilic) area of acinous cells;
- б) zymogenic (oxyphilic) area;
- 6 – intercalated duct;
- 7 – pancreatic islet;
- 8 - blood capillaries in the islet.

Task 145**SCHEME OF THE ENDOCRINE
PART OF PANCREAS**

:

**Designate endocrine cells and write hormones** β - cells _____ α - cells _____

D – cells _____

D₁ - cells _____

PP – cells _____

Task 146
Staining
Magnification

PAROTID GLAND
Hemoxilin-eosin
80^x, 400^x



Designate:

- 1 – interlobular connective tissue;
- 2 – interlobular excretory duct;
- 3 – protein secretory (terminal) part;
- 4 – myoepithelial cells;
- 5 – intercalated duct;
- 6 – striated duct;
- 7 – inlobular connective tissue;
- 8 – blood vessels;
- 9 – fat cells.

Task 147
Staining
Magnification

SUBMANDIBULAR GLAND
Hemoxilin-eosin
400^x

Draw and designate:

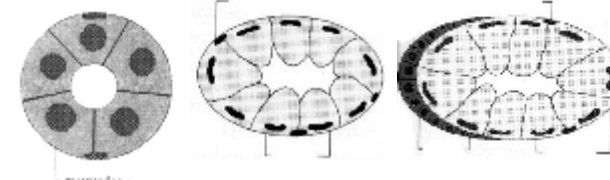
- 1 – serous secretory part;
- 2 – serous-mucosal secretory part;
- 3 – serous demilunes;
- 4 – myoepithelial cells;
- 5 – Task 41. duct;
- 6 – interlobular duct;
- 7 - intralobular connective tissue;
- 8 - blood vessel

Task 148 SCHEME OF THE SALIVARY GLAND

DUCTS of SALIVARY GLAND



SECRETORY PARTS of SALIVARY GLAND



S

Designate:

1. intercalated duct;
2. striated duct;
3. excretory duct;
4. mucous acini
5. serous acini

6. mucous acini;
7. mixed acini
8. serous demilunes;
9. myoepithelial cell

Correct tasks №№ _____

The lesson is completed

Lecturer _____

Date _____

Topic: ENDOCRINE SYSTEM

350.

1. The principle of organization of endocrine regulation. The conceptions of hormones, target cells and hormone receptors.
2. Hypothalamus: structure, functions
3. Hypophysis. Sources of development. Cellular structure of adeno- and neurohypophysis.
4. Hypothalamic-adenohypophysial and hypothalamic-neurohypophysial systems, neurohaematic organs.
5. Epiphysis. Structure. Function. Role of epiphysis in endocrine system.
6. . Thyroid gland. Tissue and cell structure. Function. Peculiarities of the secretory process in thyrocytes, its regulation.
7. . Parathyroid gland. Sources of development, tissue and cell structure, functions, effect on calcium homeostasis
8. Adrenal glands. Sources and stages of development. Structure of cortex and medullar of gland. Regulation of function.
9. Diffuse endocrine system. Types of hormone producing cells.

351. COMPONENTS of ENDOCRINE SYSTEM

352.

353.

354.I. Central part:

355.1.

356.2.

357.3.

358.

359.II. Peripheral part:

360.1.

361.2.

362.3.

363.4.

364.

365.III The organs with endocrine and non-endocrine functions

366.1.

367.2.

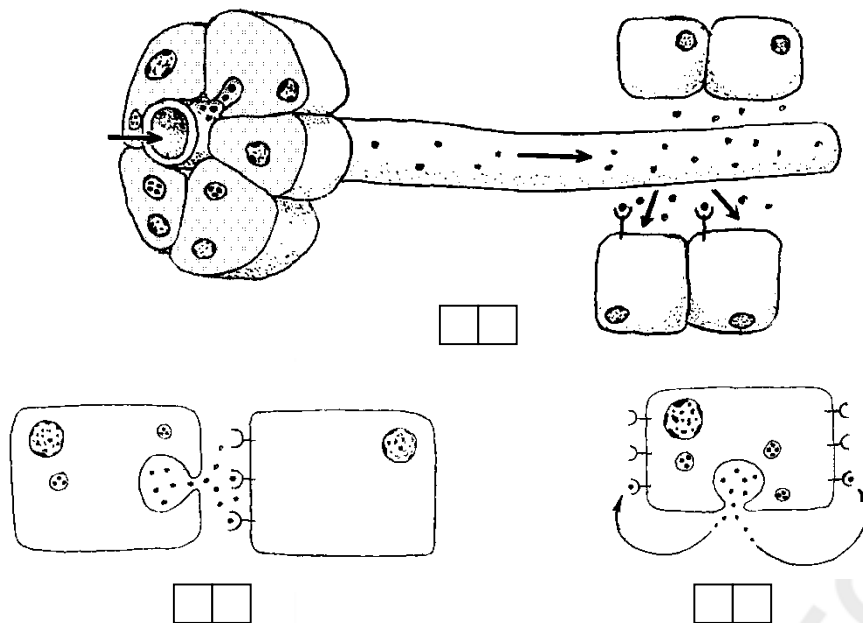
368.

369.IV. Diffuse endocrine system.

370.

371.

Task 164. SCHEME OF HORMONAL EFFECTS ON TARGET CELLS



Designate:

1 – autocrine; 2 – paracrine; 3 – endocrine (distant regulation).

Designate with letters:

A – inherent to anuclear embryonic and tumor cells;

B – provide regulation of activity level and proliferation processes in the epithelial layer;

C – provides integral regulation of the whole body.

Task 165. TERMINOLOGY

Learn the terms and concepts:

ENDOCRINY — universal method of interaction between cells due to signal molecules – hormones, produced by endocrine cells.

HORMONE — biologically active substance, circulating in the body and indicating the regulatory effect on target-cells .

TARGET CELL — a cell able to recognize the presence of a hormone by means of a specific receptor and to respond by changing the function mode.

RECEPTORS — genetically determined macromolecules (proteins, glyco- and lipoproteids), localized in different parts of the cell (plasmolemma, cytoplasm, nucleus) and specialized in perceiving biologically important signals of chemical and physical origin.

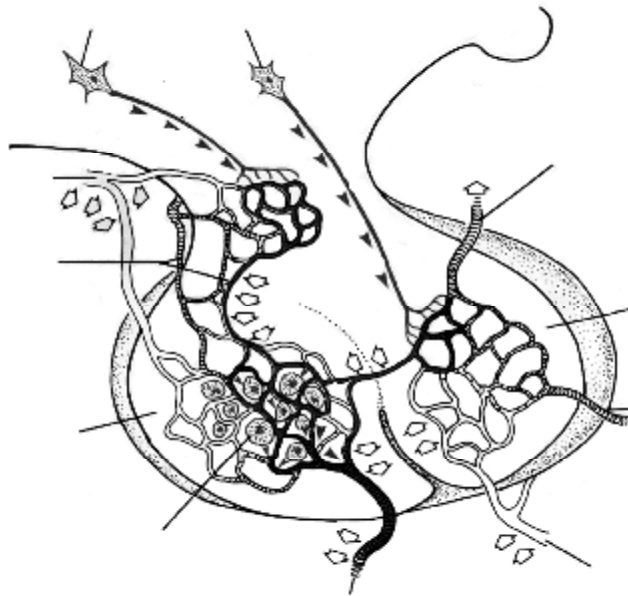
LIGAND — a molecule (hormone, growth factor, cytokine), specifically binding to the receptor.

Give definition of the terms:

Autocrine — _____

Paracrine — _____

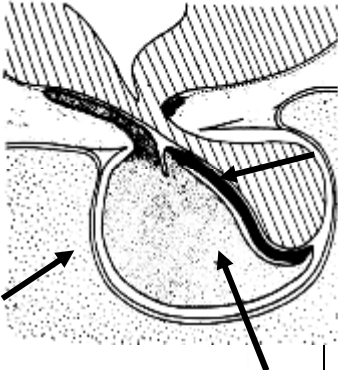
Task 166.HYPOTHALAMO-ADENOHYPOPHYSAL SYSTEM

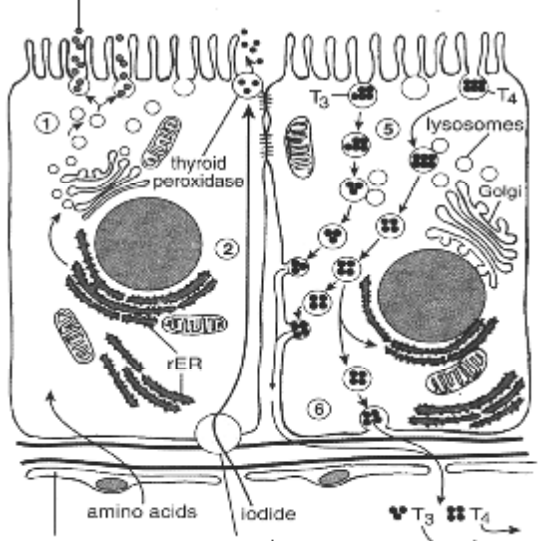


Mark:

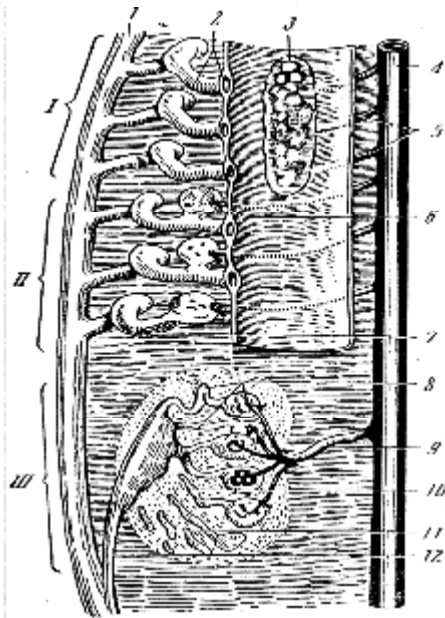
1. neurosecretory cells of anterior hypothalamus
2. primary capillaries plexus
3. axons of neurosecretory cell
4. median eminens
5. secondary capillaries plexus
6. cells of adenohypophysis
7. Pars posterior of hypophysis;
8. Axo-vasal synapse

372. Hormones of adenohypophysis	373. Target organs	374. Hormones of neurohypophysis	Target organ
Basophilic cells		1 .	
1.		2 .	
2.			
3.			
Acidophilic cells			
1.			
2.			
Adrenocorticotropocytes			
1.			

Task 167 Staining Magnification	HYPOPHYSIS Hematoxylin-eosin 400 ^x	Task 168 Staining Magnification	ADRENAL GLAND Hematoxylin-eosin 400 ^x
375. 376.  377.		379.	Regulation of adrenal gland 1. Zona glomerulosa - _____ _____ 2. Zona fasciculate - _____ _____ 3. Zona reticularis- _____ _____ Medulla _____ _____
Designate: 1 – anterior lobe; 2 – posterior lobe; 3 – intermediate lobe; 4 – hypothalamus	380. 381. <i>Draw and Mark</i> 1. oxyphilic adenocytes; 2. basophilic adenocytes; 3. chromophobic adenocytes	Draw and designate and mark hormones : 1 – capsule; 2 – zona glomerulosa _____; 3 – zona fasciculate _____; 4 – zona reticularis - _____; 5 – medulla _____;	

Task 169. SCHEME OF HORMONOGENESIS IN THE THYROID GLAND	Task 170. THYROID AND PARATHYROID GLANDS Staining Hematoxylin-eosin Magnification 80 ^x , 400 ^x
 <p>Designate:</p> <ol style="list-style-type: none"> uptake of circulating iodide; synthesis of thyroglobulin; iodination of the thyroglobulin; intrafollicular colloid fagocytosis; fusion of colloid drop with lysosome excretion of thyroxine into the capillary; closing lamina <div data-bbox="235 1161 952 1364"> <p>18. Correct tasks №№ _____</p> <p>19. The tasks are completed _____</p> <p>20. Lecturer _____</p> <p>Date _____</p> </div>	<p>Regulation of thyroid gland (Fill at home)</p> <div data-bbox="1568 367 2116 566"> <p>Organ _____</p> <p>Hormones _____</p> </div> <p>↓</p> <div data-bbox="1568 646 2116 821"> <p>Organ _____</p> <p>Hormone _____</p> </div> <p>↓</p> <div data-bbox="1568 965 2116 1109"> <p>Organ thyroid gland</p> <p>Hormones _____</p> </div> <p>↓</p> <div data-bbox="1568 1157 2116 1428"> <p>Effect on organ target cells</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> </div>

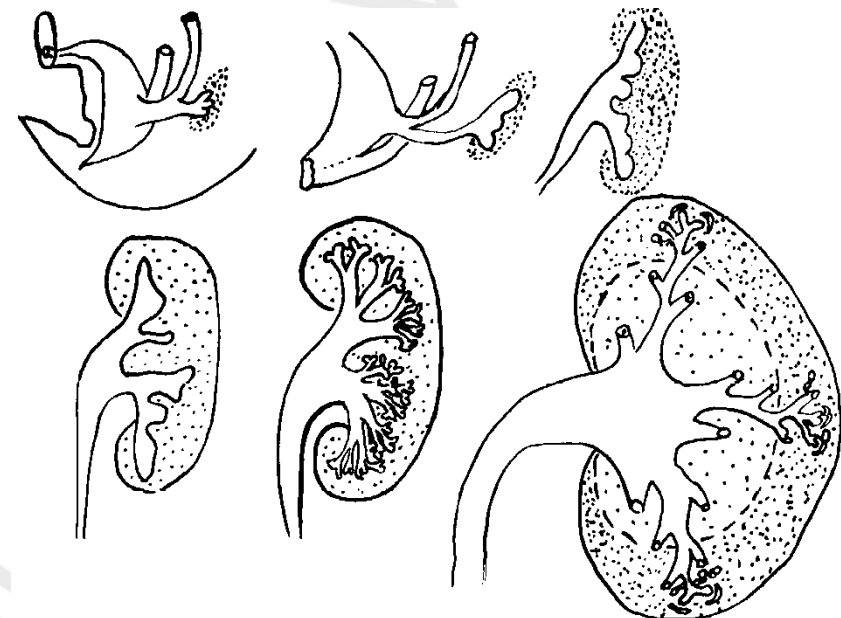
Topic EXCRETORY SYSTEM			
<ol style="list-style-type: none"> 1. The sources of embryonic development and the principal stages of ontogenesis of the kidney (pronephros, mesonephros and metanephros). 2. The structure of the kidney (cortical and medullary substances). Nephrons and urinary tracts. The structure and function of cortical and juxtamedullary nephrons. 3. Histophysiology of the glomerulus. Filtering barrier (renal histohematogenous barrier). 4. Histophysiology of different portions of the nephron (proximal part, thin tubule, distal part) and collecting tubules. 5. Renal endocrine complexes and its histophysiology. 6. Blood supply of the kidney. Characteristics of cortical and juxtamedullary circulation. The lymphatic system of the kidney. Innervation of the kidney. 7. Kidney of a newborn. Age-related characteristics of the kidney. 8. The urinary tract. Development and structure of the renal pelvis, ureter and urinary bladder. Their function significance. 		<p>The main function of the kidney : _____</p> <p>The principal stages of embryonic kidney's development:</p> <ol style="list-style-type: none"> 1. 2. 3. <p>Definition of the term “Nephron”:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>The types of nephrons:</p> <ol style="list-style-type: none"> 1. 2. 3. 	
<p>It is recommended to review:</p> <ol style="list-style-type: none"> 1. The classification, morphological and physiological characteristics of epithelial tissue. The structure of transitional epithelium. 2. The structure of smooth muscular tissue. 			
Task 171. EMBRYONAL DEVELOPMENT OF A KIDNEY		4 mm	8 mm
			11 mm



A. Three generations of the kidneys

Designate and colour:

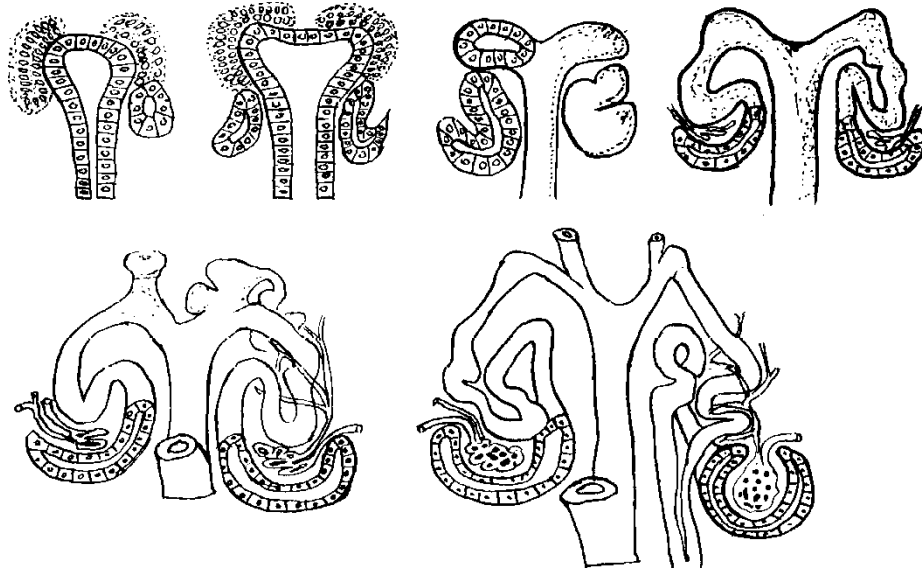
- I – pronephros (**in red**)
- II – mesonephros (**in green**)
- III - metanephros (**in blue**)
- 1 – mesonephric (Wolffian) duct (**in yellow**)
- 2 – aorta
- 3 – coelom



B. Development of the human metanephros:

Designate and colour:

- 1 – cloaca;
- 2 – Wolffian duct;
- 3 – diverticulum of Wolffian duct (**in yellow**);
- 4 – nephrogenic tissue (**in blue**).



C. Sequential stages of nephron development

Designate and colour:

- 1 – diverticulum of Wolffian duct (**in yellow**);
- 2 – derivatives of nephrogenic tissue (**in blue**);
- 3 – blood vessels (**in red**).

Task 172. **SCHEME OF NEPHRON STRUCTURE AND CELLULAR ULTRASTRUCTURE OF THE DIFFERENT PARTS OF NEPHRON**

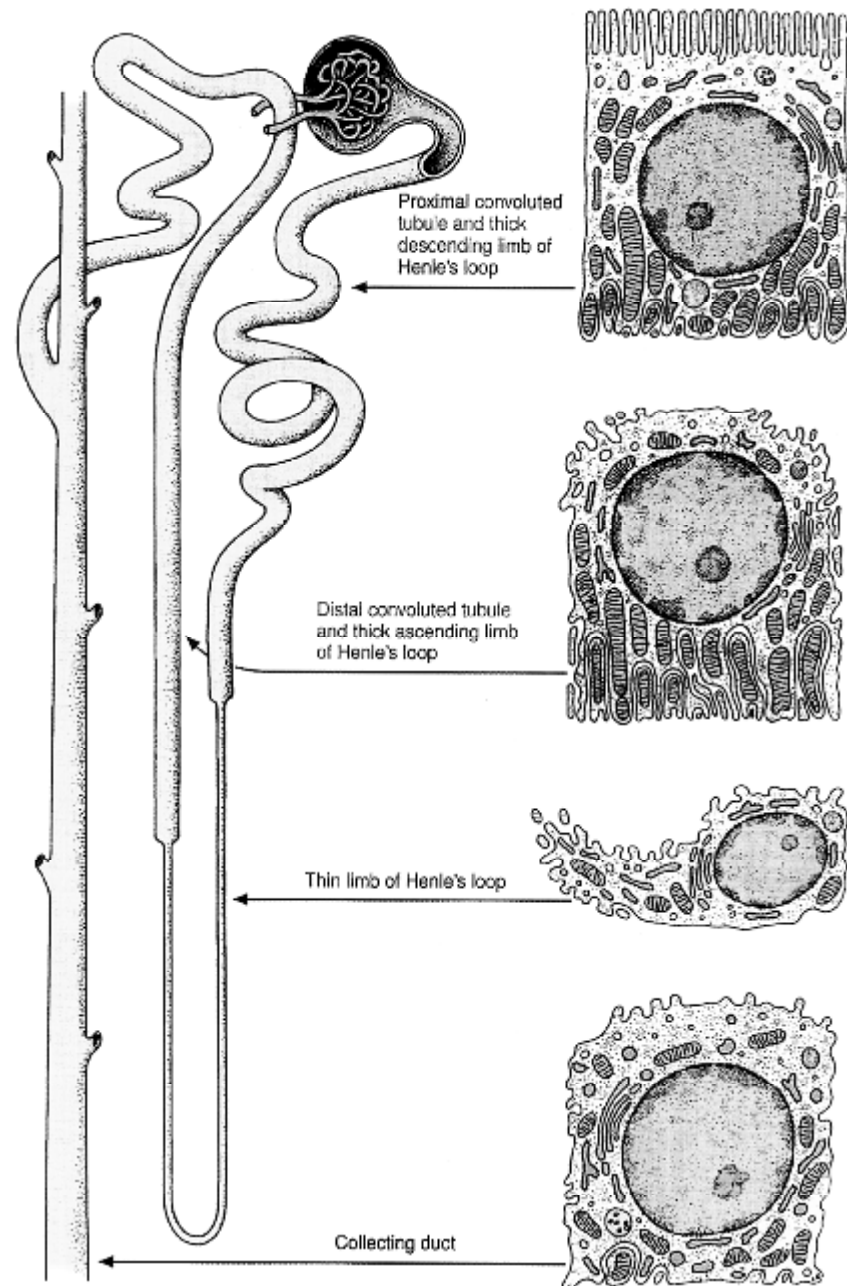
. Mark cortical and medullary substances. Designate and colour:

nephron structures:

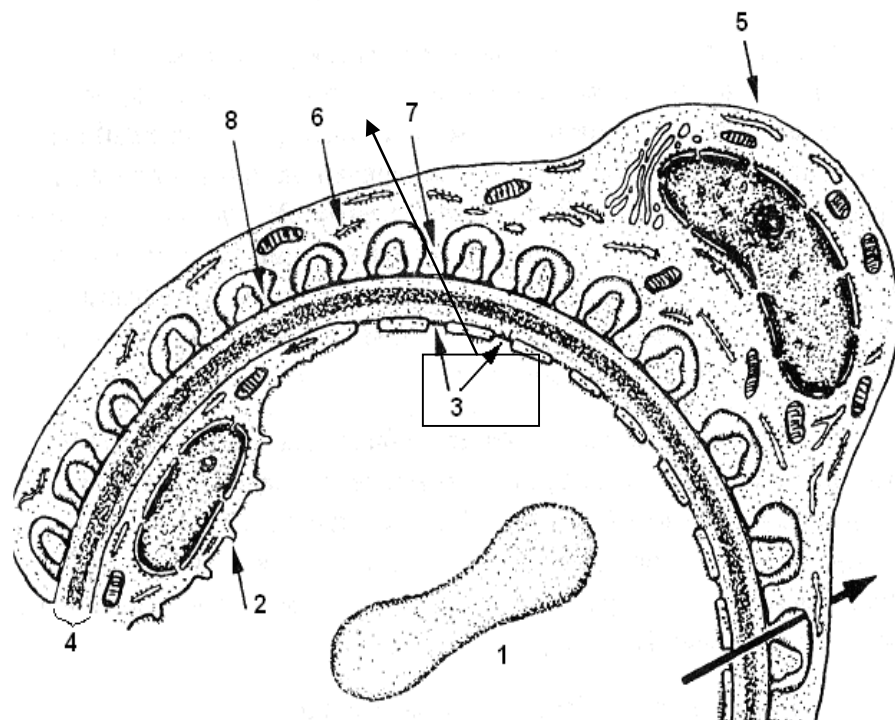
- 1 – renal corpuscle;
- 2 – proximal convoluted renal tubule (**in dark green**);
- 3 – proximal straight renal tubule (**in light green**);
- 4 – thin tubule of Henle's loop (**in brown**)
a) descending part; б) ascending part;
- 5 – distal straight tubule of Henle's loop (**in grey**);
- 6 – distal convoluted tubule of Henle's loop (**in lilac**);

structures of urinary tracts:

- 7 – collective tubule (**in yellow**);
- 8 – papillary canal;



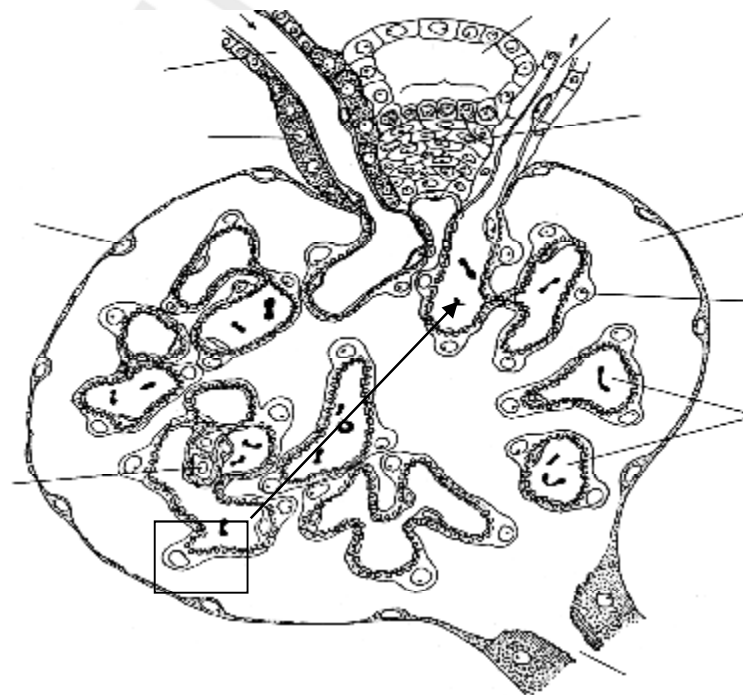
Task 173. **RENAL FILTERING BARRIER** (scheme)



Designate and colour:

- 1 – endothelial capillary cells of vascular glomerulus with fenestras (**in pink**);
- 2 – basal membrane (**in yellow**);
- 3 – podocyte of internal layer in glomerular capsule (**in grey**);
- 4 – blood capillary lumen (**in red**);
- 5 – capsule cavity of renal corpuscle (**in green**).

Task 174. **RENAL CORPUSCLE AND JUXTA-GLOMERULAR APPARATUS** (scheme)



Designate and colour

Vessels – **in red**, capsule cavity – **in green**, juxtaglomerular apparatus units **in blue**.

- 1 – afferent arteriole;
- 2 – efferent arteriole;
- 3 – glomerular capillaries;
- 4 – parietal layer of glomerular capsule;
- 5 – visceral layer of glomerular capsule;
- 6 – capsule cavity;
- 7 – proximal tubule;
- 8 – distal convoluted tubule;
- 9 – juxtaglomerular cells;
- 10 – cells of macula densa;
- 11 – juxtavascular cells;
- 12 – mesangial cells

Task 175. **KIDNEY**
 Staining Hematoxylin-eosin
 Magnification 400^x

Draw and designate:

Renal corpuscle: 1 – cells of external capsular layer; 2 – capsule cavity; 3 – vascular glomerulus;

Renal tubules: 4 – proximal renal tubule; 5 – brush border of proximal renal tubule cells; 6 – thin tubule of Henle's loop; 7 – distal straight renal tubule; 8 – distal convoluted renal tubule; 9 – collecting tubules.

Vessels: 10 – artery; 11 – vein.

Correct tasks № _____

The tasks are completed

Teacher _____

Date _____

Task 176. **URINARY BLADDER**
 Staining Hematoxylin-eosin
 Magnification 80^x



Task 177. **URETER**
 Staining Hematoxylin-eosin
 Magnification 80^x

Designate in the tasks «Urinary bladder» and «Ureter»:

I. **Mucous membrane:**

- 1 – transitional epithelium;
- 2 – proper lamina of mucous membrane.

II. **Submucous membrane:**

- 3 – blood vessels.

III. **Muscular layer:**

- 4 – internal longitudinal layer;
- 5 – external circular layer;
- 6 – vegetative intramural ganglion.

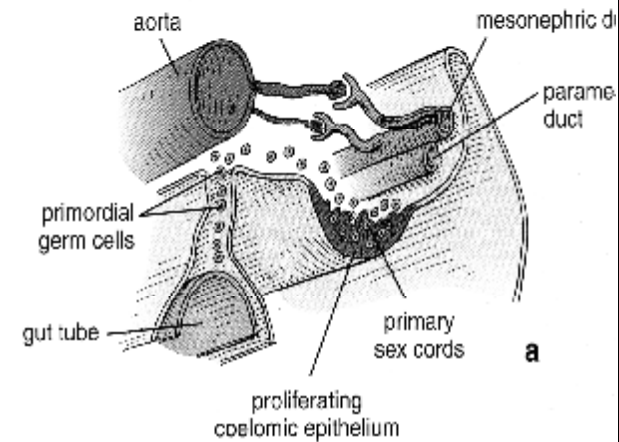
IV. **External connective tissue (serous) membrane:**

- 7 – adipose cells.

Topic MALE REPRODUCTIVE SYSTEM											
<p>382. Male reproductive system, its structure and functions.</p> <p>383. Development of the male reproductive organs.</p> <p>384. Testicle: development, structure, generative and endocrine functions of the testicle. Hemato-testicular barrier.</p> <p>385. Spermatogenesis, its periods, regulation.</p> <p>386. Seminal ducts of the male reproductive system: direct tubules, testis reticulum, excretory ducts, epididymic canal, seminal duct, ejaculatory canal. Development, structure, functions.</p> <p>387. Accessory glands of the male reproductive system: prostate (prostatic gland), seminal vesicles, bulb-urethral glands. Development, structure, functions. Age-related changes. Seminal fluid, its structure.</p> <p>It is recommended to review:</p> <ol style="list-style-type: none"> 1. Cell division: meiosis. 2. Development of the excretory system 3. Structural basis of the hypophyseal, gonadotropic function. 	<p>EMBRIONIC SOURCES of MALE REPRODUCTIVE SYSTEM</p> <p>Fill in the table at home</p> <table> <tr> <th>Embryonic source</th><th>Structures of male reproductive system</th></tr> <tr> <td>Primary sex cords</td><td>1. 2. 3.</td></tr> <tr> <td>Mesonephric tubule</td><td>1. 2. paradydimis (rudiment)</td></tr> <tr> <td>Mesonephric ducts (Wolf's ducts)</td><td>1. 2. 3. 4.appendix epidydimis (rudiment)</td></tr> <tr> <td>Paramesonephric ducts (Mullerian duct)</td><td>1. 2.</td></tr> </table>	Embryonic source	Structures of male reproductive system	Primary sex cords	1. 2. 3.	Mesonephric tubule	1. 2. paradydimis (rudiment)	Mesonephric ducts (Wolf's ducts)	1. 2. 3. 4.appendix epidydimis (rudiment)	Paramesonephric ducts (Mullerian duct)	1. 2.
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Mesonephric ducts (Wolf's ducts)	1. 2. 3. 4.appendix epidydimis (rudiment)										
Paramesonephric ducts (Mullerian duct)	1. 2.										

**Task 178. MIGRATION
OF GONOCYTES (SCHEME)**

3-5 weeks

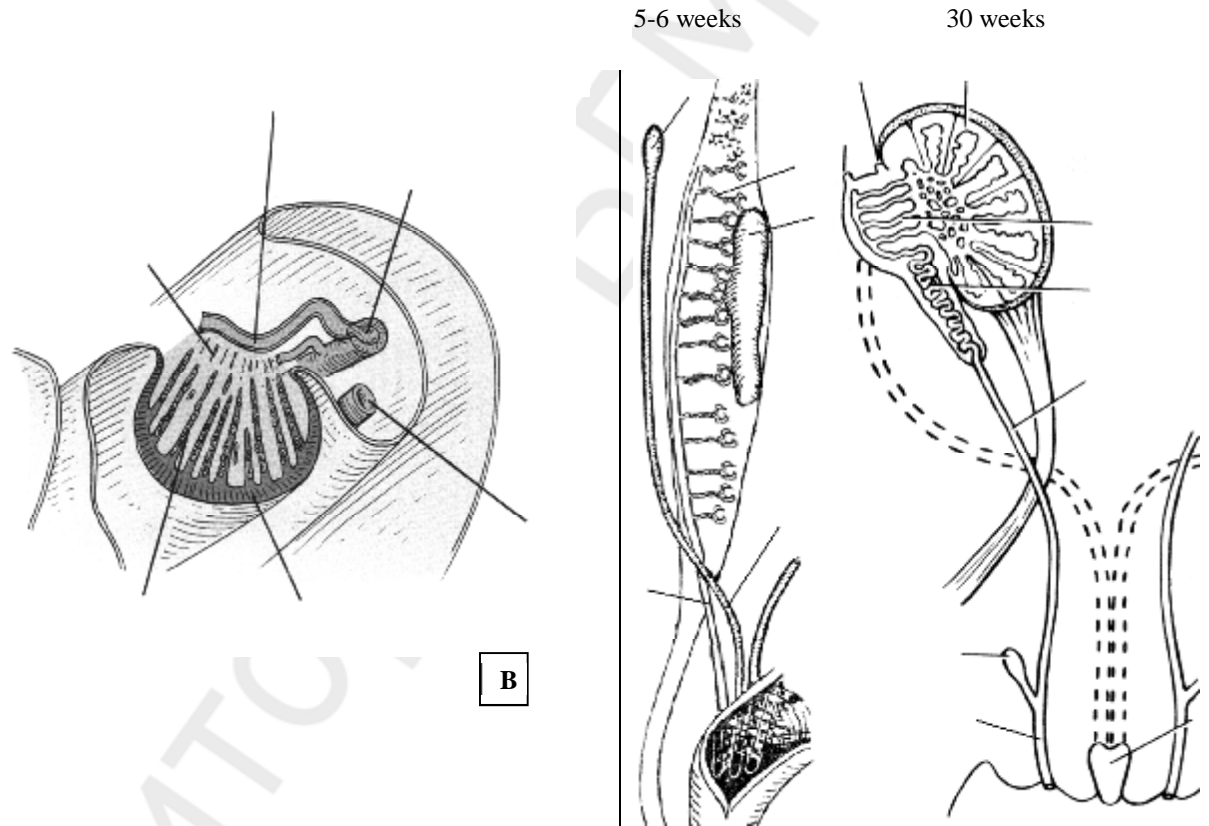


A

Designate on B :

- 1 – Degenerating mesonephric tubule;
- 2 – mesonephric duct;
- 3 – developing rete testis;
- 4 – paramesonephric duct;
- 5 – seminiferous cord;
- 6 – tunica albuginea.

Task 179. DEVELOPMENT OF INTERNAL MALE REPRODUCTIVE ORGANS

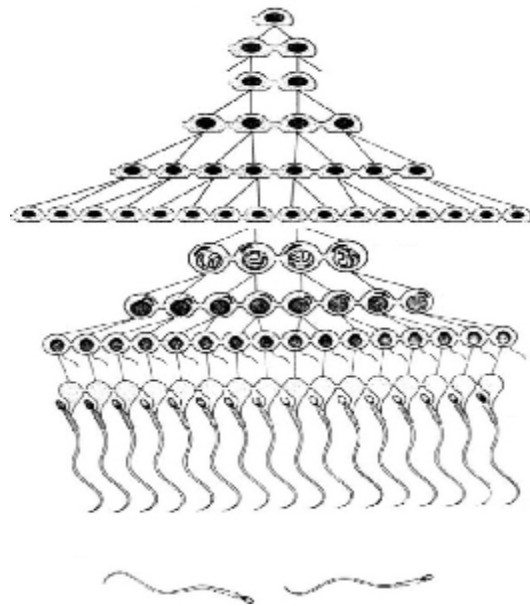


Designate on C

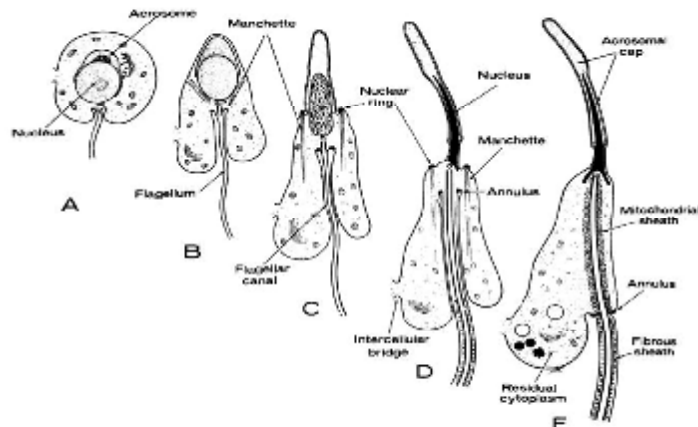
- 1. genital ridges
- 2. mesonephric tubules
- 3. mesonephric duct
- 4. paramesonephric duct
- 5. testis
- 6. efferent ductules
- 7. epididymal appendage

- 8 epididymis
- 9 ejaculatory canal;
- 10 testicular appendage
- 11 seminal vesicles;
- 12 prostatic utricle

Task 180. SPERMATOGENESIS



A



B

Designate:

A.

I - stage proliferation (spermatogonial phase):

- 1 – spermatogonia type A dark;
- 2 – spermatogonia type A pale;
- 3 – spermatogonia type B.

II - stage growth :

- 4 - primary spermatocytes;

III - stage maturation:

- 5 – secondary spermatocytes;
- 6 – spermatids.

IV - stage of formation (spermatid phase, spermiogenesis).

B.

Stage of formation include 4 phase:

- golgi phase –
- cap phase –
- acrosomal phase –
- maturation phase -

Task 181. EFFERENT DUCTULES AND DUCTUS EPIDIDYMUS

Staining

Hematoxylin-eosin

Magnification

400^x

Draw and designate:

I- ductuli efferentes (in the cross-section):

- 1 – epithelial cells;
- 2 – fibrous muscular layer;

II ductus epididymidis (in the cross-section):

- 3 – epithelium;
- 4 – muscular elastic layer.

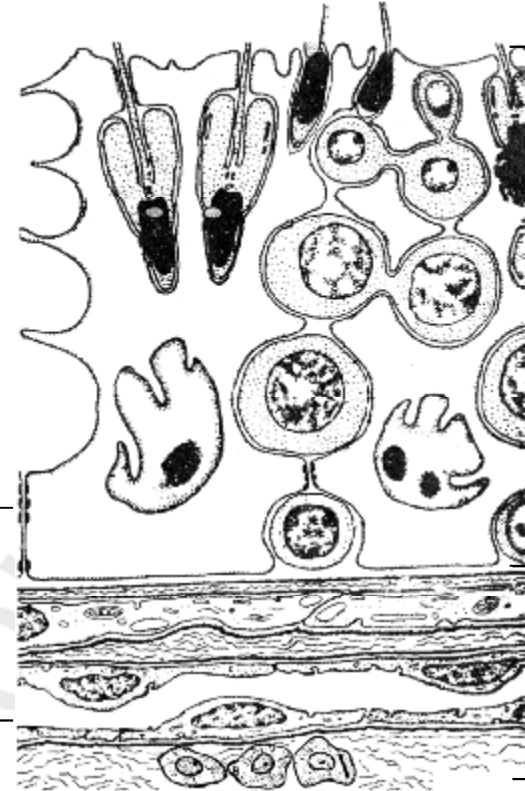
Task 182.

Staining

Hematoxylin-eosin

Magnification 400^x**TESTIS***Draw and designate:*

- | | |
|---------------------------------|-----------------------------------|
| 1 – mesothelium; | 7 – Sertoli's supporting cells |
| 2 – albuginous membrane; | (sustenocytes); |
| 3 – connective tissue between | 8 – spermatogonia; |
| tubules; | 9 – I and II level spermatocytes; |
| 4 – Leidig's interstitial cells | 10 – spermatids; |
| (glandulocytes); | 11 – spermatozoa at the stage of |
| 5 – blood capillaries; | formation; |
| 6 – basal membrane; | 12 – mature spermatozoa. |

Task 183. STRUCTURE OF THE CONVOLUTED SEMINAL TUBULE WALL AND TESTIS INTERSTITIUM (scheme)**Draw and designate:**

I – spermatogenic epithelium:
 basal part – **in yellow**, adluminal part – **in blue**;

- 1 – sustenocytes – **in green**;
 2 – spermatogonia;
 3 – I level spermatocytes;
 4 – II level spermatocytes;
 5 – spermatids;
 6 – spermatozoa.

II – interstitium:

- 7 – Leidig's interstitial cells (glandulocytes).

III – structures of hemato-testicular barrier:

basal membrane – **in orange**, connective (fibrous) coat – **in violet**, myoid layer – **in red**;

- 8 – dense contacts between sustenocytic processes;
 9 – basal membrane of spermatogenic epithelium;
 10 – basal (internal fibrous) layer;
 11 – internal basal membrane of myoid cells;
 12 – myoid cells;
 13 – external basal membrane of myoid cells;
 14 – external fibrous coat (наружный);
 15 – basal membrane of blood capillary;
 16 – endotheliocyte of blood capillary.

Task 184. **PROSTATIC GLAND**
 Staining: Hematoxylin-eosin
 Magnificate: 80^x, 400^x

Draw and designate:

- 1 – secretory portions of the gland;
- 2 – excretory ducts of the gland;
- 3 – bands of smooth muscular cells;
- 4 – connective tissue septa;
- 5 – blood vessels;
- 6 – prostatic concretions;

7 – transitory epithelium of the urethra.

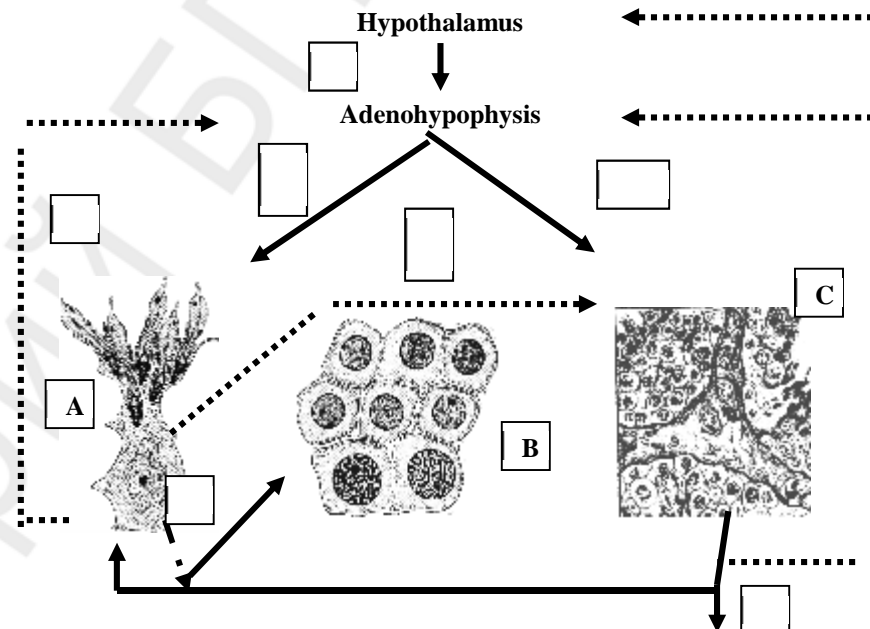
Correct tasks № _____

The tasks are completed

Teacher _____

Date _____

Task 185. **HOMONAL REGULATION of MALE REPRODUCTIVE FUNCTION**



A - Sertoli cell; B – spermatocytes; C- Leydig cell.

1. Gonadotrophin-releasing hormone _____

2. FSH _____

3. LH _____

4. ABP _____

5. Inhibin _____

6. estrogen _____

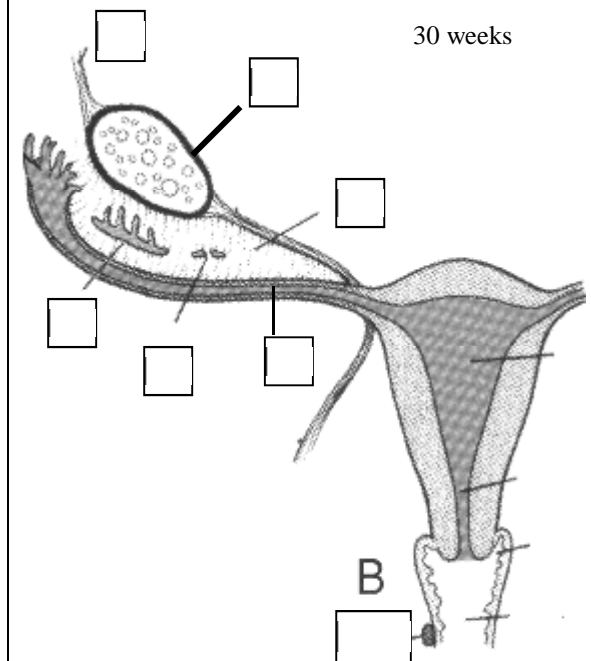
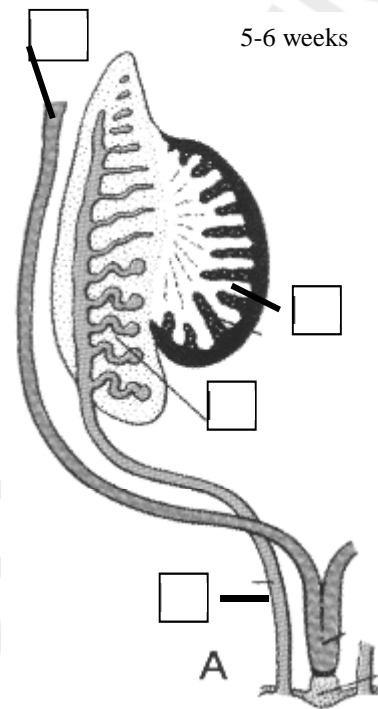
7. testosterone effect _____

Topic FEMALE REPRODUCTIVE SYSTEM

1. Structure of the ovary, embryonic sources of its development, age-related changes.
2. Oogenesis, its stages. Differences between oogenesis and spermatogenesis.
3. Ovarian follicles and their varieties.
4. Mature follicle. Ovulation.
5. Yellow body, its development, involution, functional value.
6. Follicular atresia. Structure of the atretic body.
7. Incretory function of the ovaries.
8. Development and structure of the oviducts.
9. Uterus, its structure, cyclic and age-related changes.
10. Ovario-menstrual cycle, its regulation.
11. Vagina, its structure, cyclic changes.

It is recommended to review the material of the lecture «Female reproductive system».

Task 186 DEVELOPMENT OF FEMALE REPRODUCTIVE ORGANS



Designate

A Indifferent stage

1- primary sex cord

2- mesonephrous tubule

3- paramesonephric duct

4- mesonephric duct

B differentiate stage

5- suspensory ligament of ovary

6- ovary

7- mesovarium

8- uterine tube

9- paroophoron

10 – epoophoron

11 – gartner's cyst

Task 187. DEVELOPMENT OF FEMALE REPRODUCTIVE ORAN	Task 188. SCHEMA, SHOWING CHANGES IN THE OVARY	
<p><i>FULL AT HOME</i></p> <p><i>INDIFFERENTIATED STAGE</i></p> <p>1 –</p> <p>2 –</p> <p>3 –</p> <p>4 –</p> <p>DIFFERENTIATED</p> <p>Primary sex cord with primordial germ cells</p> <p>5 –</p> <p>6 –</p> <p>Paramesonephric duct</p> <p>7 –</p> <p>8 –</p> <p>Mesonephric duct</p> <p>9 –</p> <p>10 –</p>		

Task 189. **OVARY**
Staining Hematoxylin-eosin
Magnification 80^{\times} , 400^{\times}
n

Draw and designate:

I – ovarian membranes:

- 1 – rudimental epithelium;
- 2 – albugineous membrane.

II – primordial follicles:

- 3 – primary oocyte;
- 4 – flattened follicle cells.

III – growing (primary) follicle:

- 5 – primary oocyte;
- 6 – zona pellucida;
- 7 – granular layer.

IV – secondary follicle:

V – mature follicle:

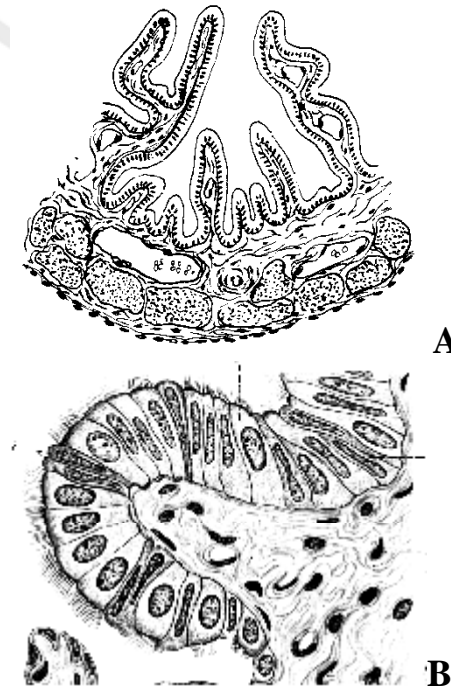
- 8 – primary oocyte;
- 9 – zona pellucida
- 10 – cumulus oophorus;
- 11 – granulosa cells;
- 12 – corona radiata;
- 13 – antrum with follicular fluid;
- 14 – theca interna;
- 15 – theca externa;

V – atretic body;

VI – yellow body:

- 16 – lutein cells
- 17 – blood capillaries

Task 190. **OVIDUCT**
Staining Hematoxylin-eosin
Magnification 80^{\times}



Designate: A

I – mucous membrane:

- 1 – columnar ciliated epithelium;
- 2 – lamina propria of the mucous membrane.

II – muscular layer;

- 3 – circular membrane;
- 4 – longitudinal membrane.

III – serous coat.

B – columnar epithelium

- 5 – ciliated cells;
- 6 – nonciliated cells;

Task 191. UTERUS OF THE
CAT
Staining Hematoxylin-eosin
Magnification 80^{\times} , 400^{\times} .

Draw and designate:

I – endometrium:

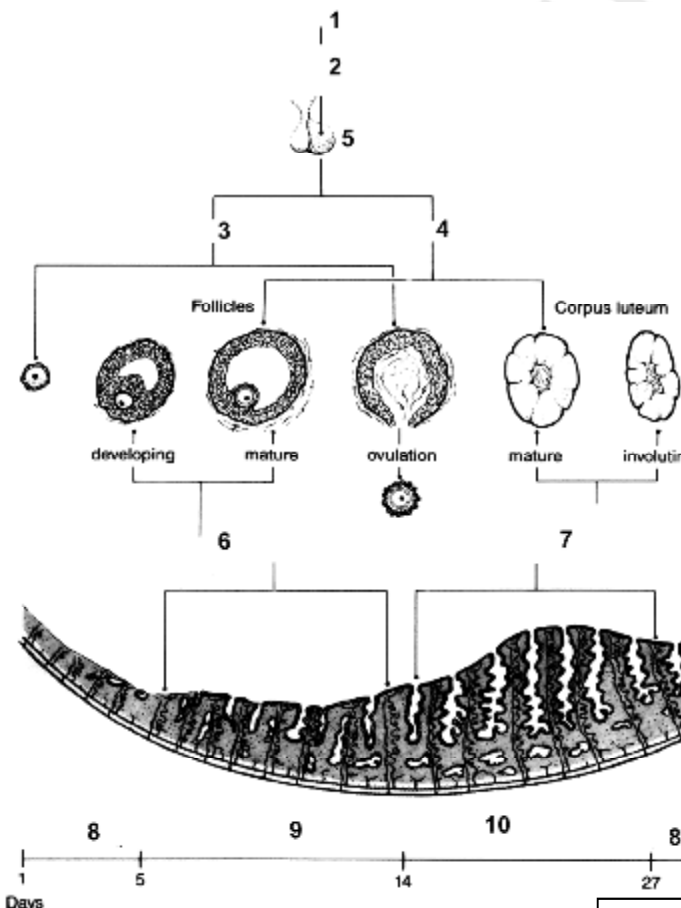
- 1 – columnar epithelium;
- 2 – proper lamina of the mucous membrane;
- 3 – uterine gland.

II – myometrium:

- 4 – submucous membrane;
- 5 – vascular layer;
- 6 – supravascular layer;
- 7 – blood vessels.

III – perimetrium.

Task 192. OVARIO-MENSTRUAL CYCLE



Write hormones

1 – Hypothalamus

2 –

3 –

4 –

5 –

6 –

7 –

Name the phase of menstruale cycle

8 –

9 –

10 –

Correct tasks № _____

The lesson is completed

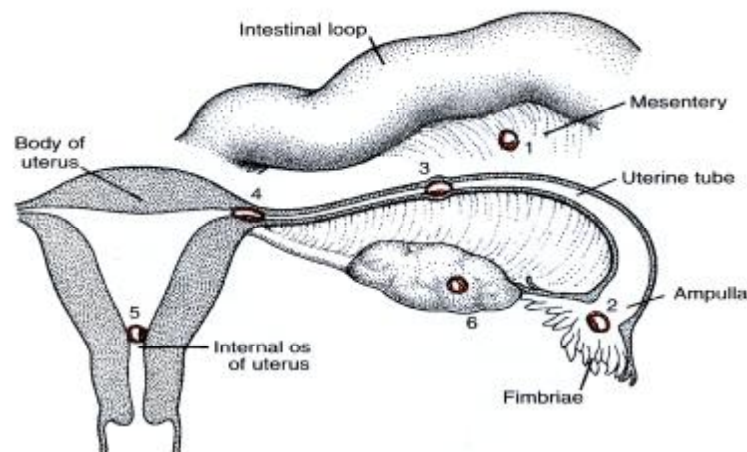
Teacher

Date « ____ » ____

Task 193. NORMAL IMPLANTATION SITES OF THE BLASTOCYST.

Write down the possible sites of abnormal implantation:

1. 4.
2. 5.
- 3.



Task 194. PERIODS OF HUMAN EMBRYOGENESIS AND PHASES OF MENSTRUAL CYCLE

Period of embryogenesis	Organism	Time of embryonic development	Days of menstrual cycle
Fertilization	Conceptus	1-st day	14-15
Cleavage		2-5-rd days	16-19 (beginning secretory phase)
Gastrulation early		6-13th days	20-27 (middle secretory phase, corpus luteum secretes, implantation)
late	Embryo	14-21-st days	28-35 (beginning placentation, absent menstrual flow)
Organo- and hystogenesis		4-9-th weeks	≥ 36 Following development of placenta
	Fetus	10-40-th weeks	

Task 195. LATERAL AND AMNIOTIC FOLDS OF CHICKEN'S EMBRYO

Staining Hematoxylin
Magnification 80 x, 400x

Designate:

1. Nerve tube.
2. Ectoderm.
3. Notochord.
4. Somite.
5. Nephrotome.
6. Layers of splanchnotome.
7. Endoderm.
8. Forming intestine
9. Blood vessels
10. Lateral fold.

Topic 3-4 WEEKS OF HUMAN EMBRYOGENESIS. ORGANO- AND HYSTOGENESIS. PERIODS OF DEVELOPMENT

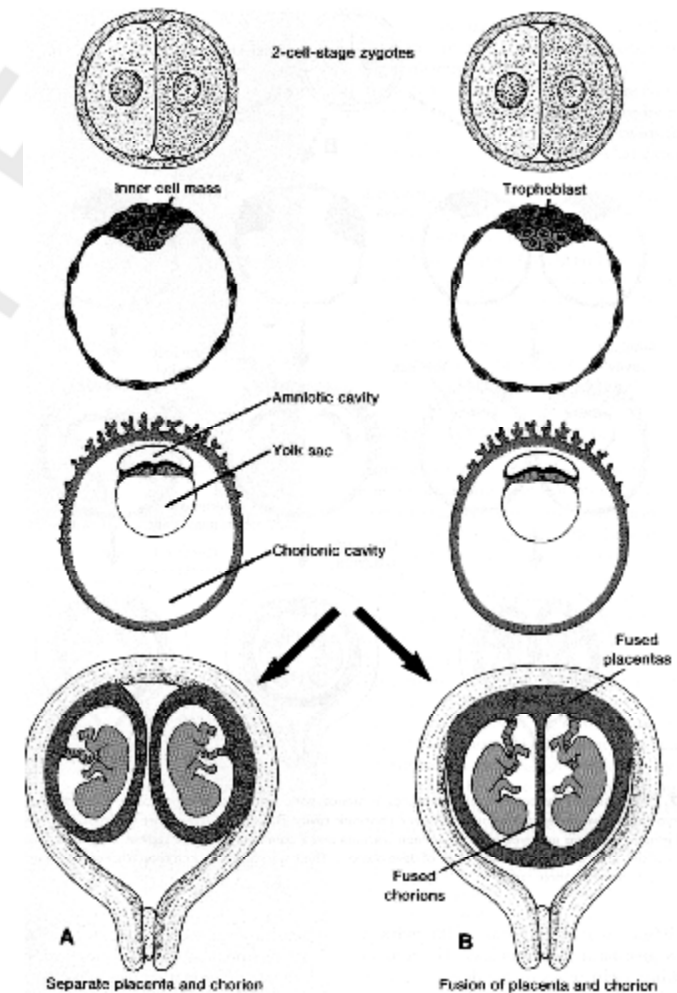
CRITICAL

1. Embryos at the end of 3-rd week. The early stages of development of nervous and cardiovascular system.
2. Organo- and hystogenesis. Definition. The components of embryonic development.
3. Embryos structure on the 4-th week. Primordial formation and development of the main system organs on the 4-8 weeks of embryogenesis.
4. Critical periods of development. The role of exo- and endogenic factors in the occurrence of anomalies and malformations. Atypical hystogenesis and its forms.

REPEAT:

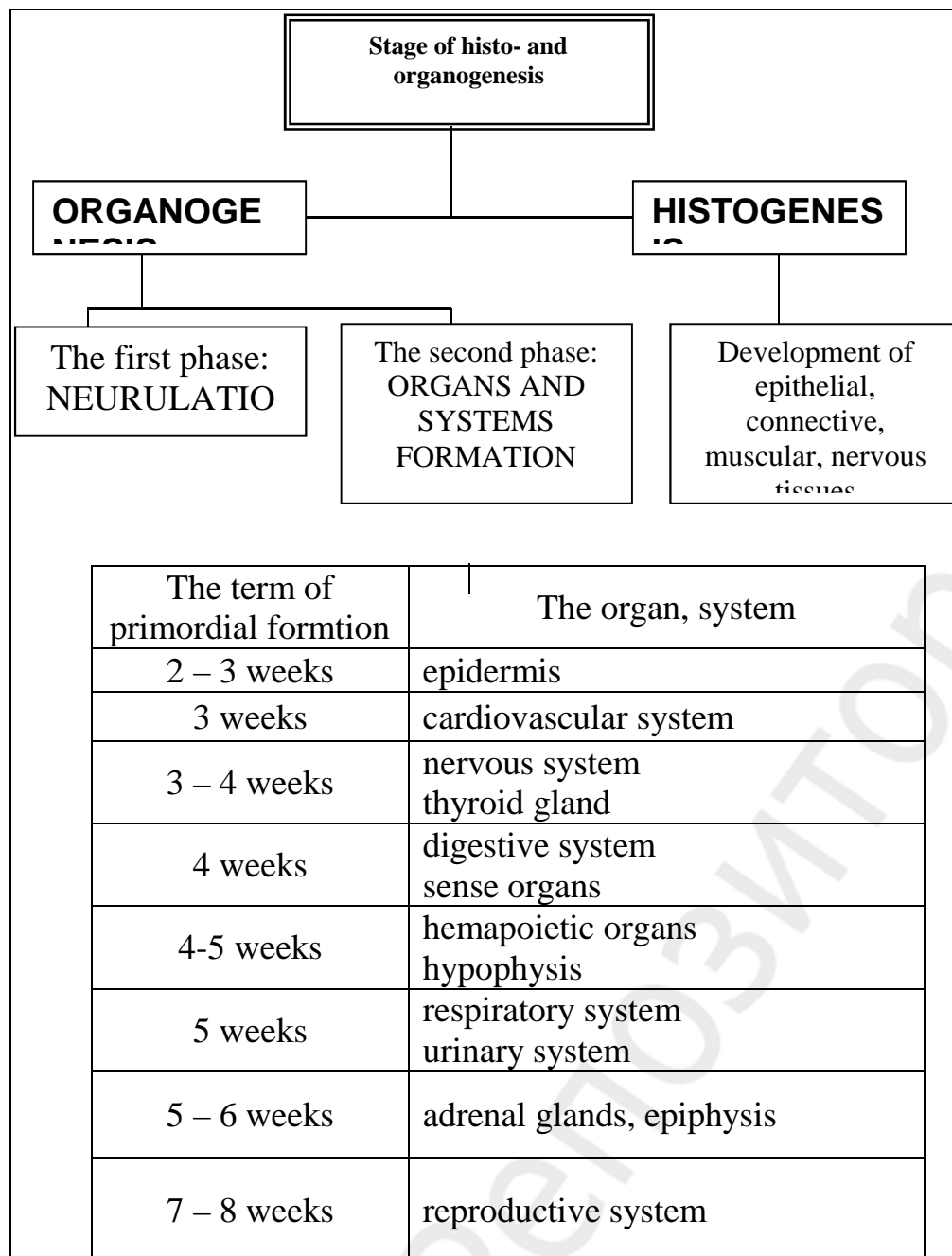
- Fertilization
- Cleavage
- Gastrulation
- Differentiation of germ layers.

Development of dizygotic twins

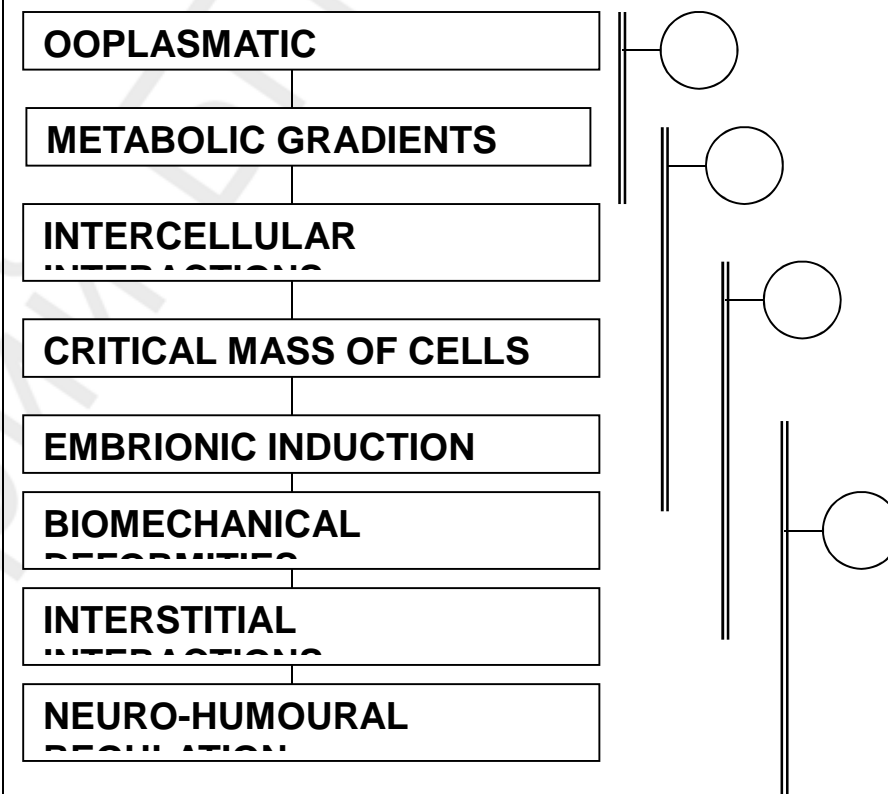


<p>The definition of the concept “CRITICAL PERIODS OF DEVELOPMENT”: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>The reasons of the critical periods:</p> <ol style="list-style-type: none"> 1. Activation of genetic information. (determination of the development). 2. Changes of trophic types. 3. Changes of regulating mechanisms in the course of development. 	<p>The Task 196. CRITICAL PERIODS OF DEVELOPMENT (CPD) IN ONTOGENESIS</p> <p><i>Fulfill:</i></p> <p>A –write down the definition of CPD;</p> <p>B –enumerate CPD of the human ontogenesis;</p> <p>C –study the classification of development anomalies; compare the anomaly groups with the basic processes of embryogenesis.</p> <div style="text-align: right;">/ C</div>
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<p><i>Enumerate the critical periods of the human ontogenesis :</i></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<div style="border: 1px solid black; padding: 2px 5px; width: 20px; margin: 0 auto;">B</div>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left; padding: 5px;">CLASSIFICATION OF DEVELOPMENT ANOMALIES (according to A.G.Knorre)</th> </tr> <tr> <th style="width: 50%; text-align: center; padding: 5px;">Groups of anomalies</th> <th style="width: 50%; text-align: center; padding: 5px;">The character development changes</th> </tr> <tr> <td style="padding: 5px;">Anomalies caused by cellular reproduction disturbance</td> <td style="padding: 5px;">growth impairment of separate rudiments</td> </tr> <tr> <td style="padding: 5px;">Caused by impairment of cell and cellular complexes migration</td> <td style="padding: 5px;">changes of organ and tissue spatial interrelation</td> </tr> <tr> <td style="padding: 5px;">Caused by unusual directions of cell and tissue differentiation</td> <td rowspan="2" style="padding: 5px; vertical-align: top;">formation of abnormal cell and tissue structures or atypical correlation of normal structures</td> </tr> <tr> <td style="padding: 5px;">Caused by disruption of correlative connections between cellular complexes, rudiments of organs and tissues.</td> </tr> <tr> <td style="padding: 5px;">Caused by changing processes of physiological cell death</td> <td style="padding: 5px;">fall out of “reverse development” of germ provisory structures</td> </tr> <tr> <td style="padding: 5px;">Caused by metabolic disturbances</td> <td style="padding: 5px;">without marked morphological defects</td> </tr> </table>	CLASSIFICATION OF DEVELOPMENT ANOMALIES (according to A.G.Knorre)		Groups of anomalies	The character development changes	Anomalies caused by cellular reproduction disturbance	growth impairment of separate rudiments	Caused by impairment of cell and cellular complexes migration	changes of organ and tissue spatial interrelation	Caused by unusual directions of cell and tissue differentiation	formation of abnormal cell and tissue structures or atypical correlation of normal structures	Caused by disruption of correlative connections between cellular complexes, rudiments of organs and tissues.	Caused by changing processes of physiological cell death	fall out of “reverse development” of germ provisory structures	Caused by metabolic disturbances	without marked morphological defects
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Caused by metabolic disturbances	without marked morphological defects																



The task 197. THE BASIC EPIGENETIC MECHANISMS OF EMBRYONIC DEVELOPMENT REGULATION



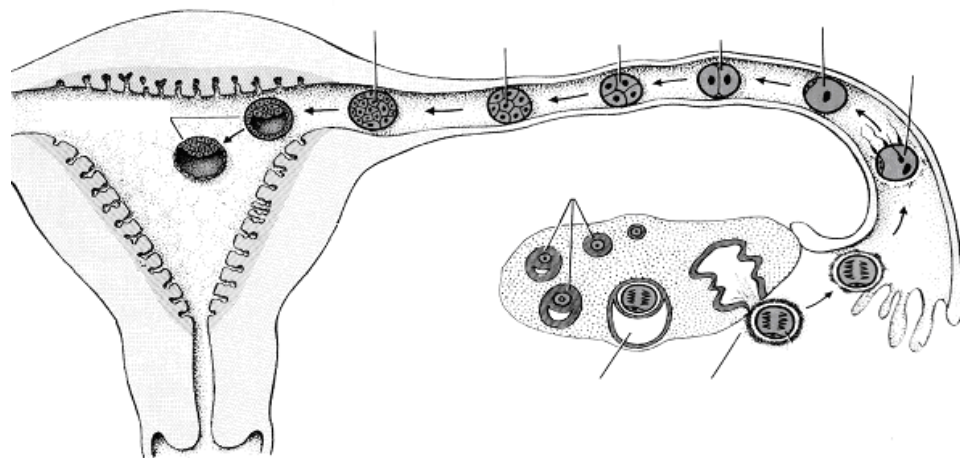
Write down the stages of embryogenesis, which correspond to regulation mechanisms into the circles as shown in the scheme:

- 1 – fertilisation;
- 2 – cleavage;
- 3 – gastrulation;
- 4 – histo- and organogenesis.

Task 198. SCHEME OF CONCEPTUS MIGRATION (1ST WEEK).

Designate:

- | | |
|------------------------|-----------------------------------|
| 1. immature follicles; | 6. two-cell stage (30 hours); |
| 2. tertiary follicle; | 7. four-cell stage (40-50 hours); |
| 3. ovocyte; | 8. eight-cell stage (60 hours); |
| 4. fertilization; | 9. morula; |
| 5. zygote; | 10. blastocyst. |

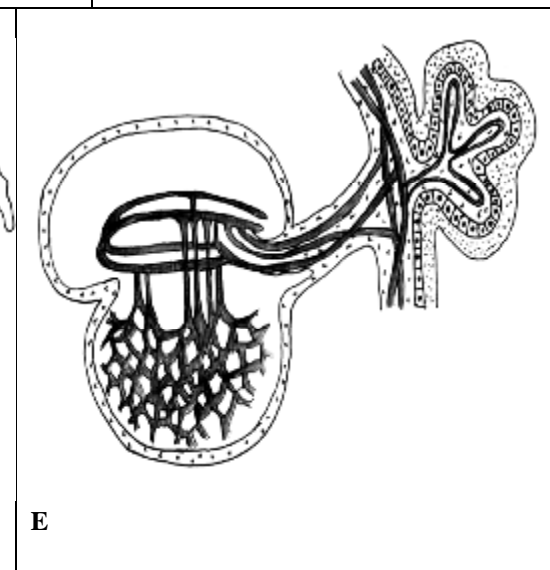
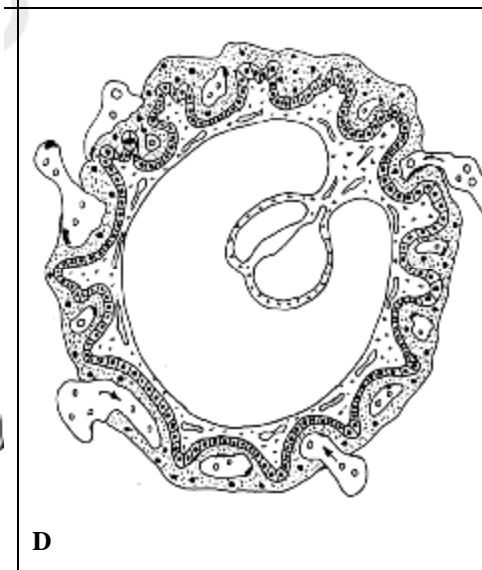
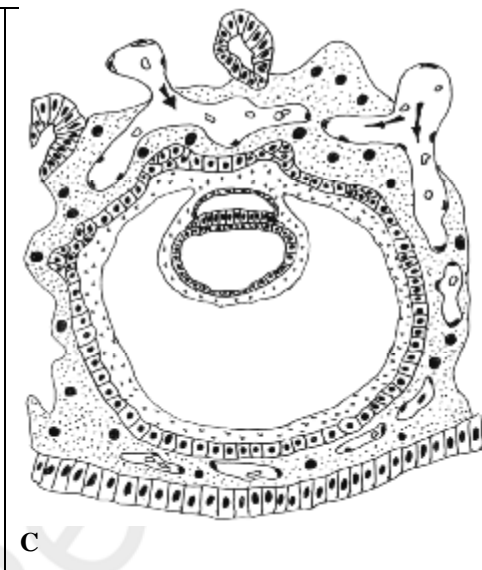
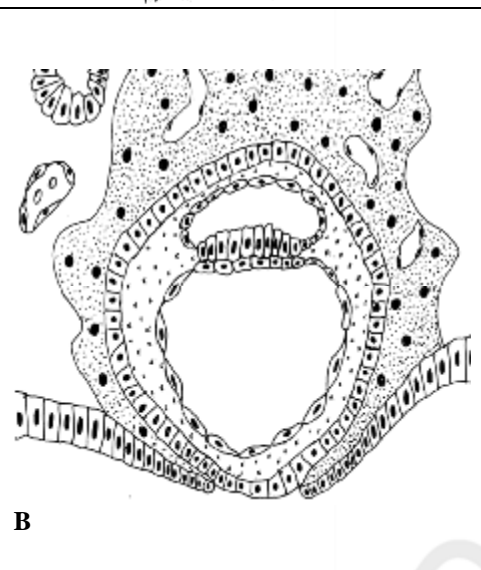
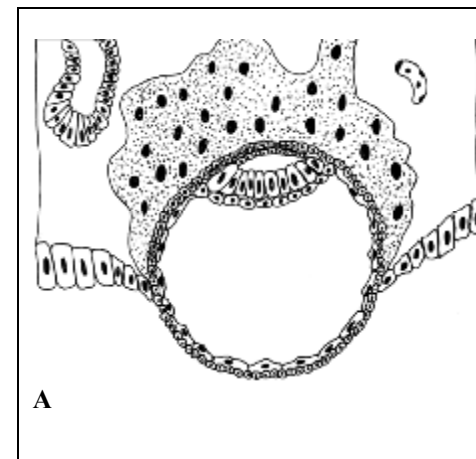


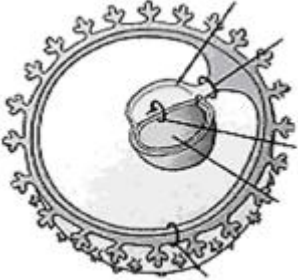
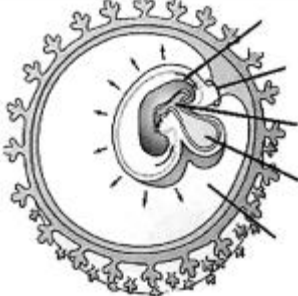
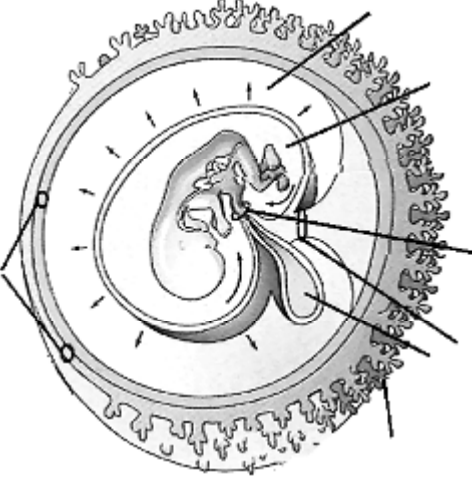
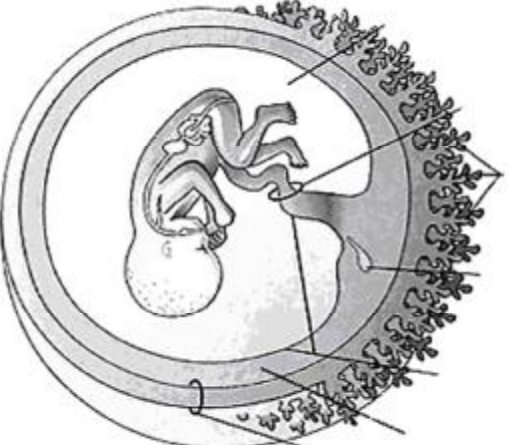
Task 199. SCHEME OF EXTRAEMBRYONAL ORGANS FORMATION.

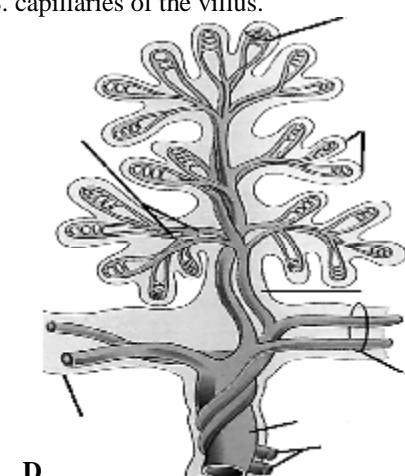
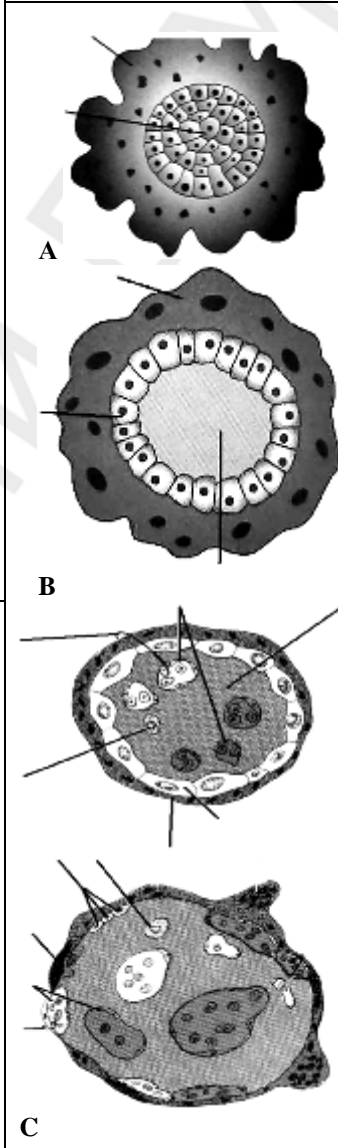
A – beginning of implantation, 6th day; B – end of implantation, 7-8th days; C – 13th day; D – 16th day; E – beginning of placental blood flow, 20th day.

Designate:

- embryonic disc:
 - epiblast;
 - hypoblast;
- amniotic sac;
- yolk sac;
- cytotrophoblast;
- syncytiotrophoblast;
- uterine blood vessel;
- uterine glands;
- extraembryonic mesoderm;
- chorionic wall;
- chorionic villi;
- allantois;
- amniotic stalk;
- blood vessels of chorionic villi;
- umbilical blood vessels.



 <p>A</p>	<p>Task 200. SCHEME OF EXTRAEMBRYONIC INTERPOSITION. A – 3^d week; B – 4th week; C – 10th week; D – 20th week.</p> <p>Designate:</p> <ol style="list-style-type: none"> embryonic disc; amnion; yolk sac; amniotic stalk; chorionic wall: chorionic cavity; chorionic plate; umbilical cord. 	<p>Task 201. SCHEME OF CHORIONIC VILLOUS STRUCTURE.</p>
 <p>B</p>		<p>Designate:</p> <p>A – primary villus; B – secondary villus; C – tertiary villus during the Ist and II^d half of pregnancy.</p> <ol style="list-style-type: none"> cytotrophoblast; syncytiotrophoblast; mesenchyma; capillaries of villi; Kaschenko-Hofbauer's cells; placental barrier. <p>D – anchor villus.</p> <ol style="list-style-type: none"> umbilical vein; umbilical arteries; amniotic wall; chorionic plate; mesenchyma of the villus; blood vessels of the villus; terminal branching; capillaries of the villus.
 <p>C</p>	 <p>D</p>	



<p>Task 202. HUMAN PLACENTA (fetal and maternal parts) Hematoxylin-eosin 80^x, 400^x</p> <p>Staining Magnification</p> <p><i>Perform a picture on the basis of 2 preparations.</i></p> <p>Mark:</p> <ol style="list-style-type: none"> 1 – amniotic epithelium; 2 – chorionic plate; 3 – trophoblastic villi epithelium (cytotrophoblast and syncytiotrophoblast); 4 – villus mesenchyma; 5 – villus blood vessels; 6 – fibrinoid; 7 – lacunas with maternal blood; 8 – basal layer; 9 – decidual cells. 	<p>Task 203. MAMMARY GLAND Hematoxylin-eosine 80^x</p> <p>Staining Magnification</p> <p><i>Draw and designate:</i></p> <p>I – glandular lobe (acinus):</p> <ol style="list-style-type: none"> 1 – secretory parts (alveoli); 2 – lactocyte; 3 – myoepitheliocyte; <p>II – interlobular septum:</p> <ol style="list-style-type: none"> 4 – interlobular mesenchyma; 5 – interlobular lacteal duct; 6 – blood vessels. <p>Correct tasks No _____</p> <p>The tasks are completed</p> <p>Teacher _____</p> <p>Date _____</p>
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Topic HUMAN embryonal development

5. Fertilisation, its phases, conditions necessary for fertilization.
6. Cleavage. Influence of external and internal factors on the process of cleavage. Blastocyst structure.
7. Differentiation of the trophoblast. Implantation. Changes in the structure of uterus mucousa during pregnancy.
8. Differentiation of the embryoblast. Formation and functions of the amnion, yolk sac, allantois.
9. Chorion. Structure of chorionic fibers. Development and structure of fetal membranes.
10. Placenta. Structure and functions. Hormonal regulation of pregnancy (mother's organism and placenta). Topography of the fetus and its membranes in the uterus during pregnancy.
11. Mammary gland, sources of development, structure, function. Morphological differences between lactational and unlactational mammary gland.
12. Critical periods of development. The role of exo- and endogenic factors in the occurrence of anomalies and malformations. Atypical histogenesis and its forms.

The stages of embryonic development:

- 4.
- 5.
- 6.
- 7.

Call:

1) The type of human oocyte_____

2) Cleavage_____

3) The type of blastula_____

4) Gastrulation_____

5) Extraembryonic organs_____

LIST OF HISTOLOGICAL PREPARATIONS

Spring semester

1-st intermediate control

1. Oocyte – яйцеклетка.
2. Sperm – сперматозоид.
3. Late gastrula – гастрюла.
4. Mesothelium – мезотелий.
5. Cuboidal epithelium of kidney – кубический эпителий почки.
6. Columnar epithelium of intestine – тонкий кишечник (цилиндрический эпителий).
7. Pseudostratified ciliated epithelium of trachea – трахея (многорядный мерцательный эпителий).
8. Stratified squamous nonkeratinized epithelium of cornea – роговица глаза (многослойный плоский неороговевающий эпителий).
9. Stratified squamous keratinized epithelium of skin – кожа пальца (многослойный плоский ороговевающий эпителий).
10. Stratified transitional epithelium of urinary bladder – мочевого пузыря (многослойный переходный эпителий).
11. Human blood smear – мазок крови человека.

2-nd intermediate control

1. Loose connective tissue – рыхлая волокнистая соединительная ткань.
2. Tendon (longitudinal section) сухожилие.
3. Adipose tissue – белая жировая ткань
4. Mast cells – тучные клетки.
5. Hyaline cartilage – гиалиновый хрящ.
6. Elastic cartilage. – эластический хрящ.
7. Fibrous cartilage – волокнистый хрящ.
8. Intramembranous ossification – прямой остеогенез.
9. Endochondral ossification – образование кости на месте хряща.
10. Femoral bone (cross section) – поперечный срез бедренной кости.
11. Smooth muscle tissue – мочевого пузыря (гладкая мышечная ткань).
12. Skeletal muscle tissue – скелетная мышечная ткань.
13. Cardiac muscle tissue – сердечная мышечная ткань.
14. Unmyelinated nerve fibers – немиелинизированное нервное волокно.
15. Myelinated nerve fibers – миелинизированное нервное волокно.
16. Brain cortex – кора больших полушарий.

17. Cerebellum- мозжечок.
18. Spinal cord – спинной мозг.
19. Cerebrospinal ganglion – спинномозговой узел.
20. Retina – сетчатка глаза.
21. Spiral organ – спиральный орган.
22. Skin of finger – кожа пальца
23. Skin with a hair – кожа с волосом.

Autumn semester

1-st intermediate control

1. The tongue of rabbit. Filiform papillae – язык кролика, листовидные сосочки.
2. Development of tooth. Enamel organ- Развитие зуба, эмалевый орган.
3. Development of tooth. Late stage – развитие зуба, поздняя стадия.
4. Transversal section of the oesophagus – поперечный срез пищевода.
5. Fundus of the stomach – дно желудка.
6. Pylorus of stomach – пилорический отдел желудка.
7. Duodenum – 12-перстная кишка
8. Jejunum – тонкий кишечник
9. Colon – толстый кишечник
10. Parotid gland – околоушная железа.
11. Submandibular gland – поднижнечелюстная железа
12. Liver – печень.
13. Pancreas – поджелудочная железа
14. Red bone marrow – красный костный мозг.
15. Thymus – зобная железа. Тимус.
16. Lymph node – лимфатический узел.
17. Spleen – селезенка.
18. Palatine tonsil – небная миндалина.
19. Lung – легкое.
20. Trachea – трахея.
21. Aorta – аорта.
22. Muscular artery – артерия мышечного типа.
23. Vein – вена.
24. Arterioles, venules, capillaries – артериолы, венулы, капилляры.
25. Purkinje fibers – волокна Пуркинье.

2-nd intermediate control

1. Hypophysis - гипофиз.
2. Thyroid gland - щитовидная железа,
3. Parathyroid gland - паращитовидная железа.
4. Adrenal gland - надпочечник.
5. Kidney - почка.
6. Ureter - мочеточник.
7. Urinary bladder - мочевого пузыря.
8. Testis - семенник.
9. Epididymis – придаток семенника.
10. Prostate - простата.
11. Ovary - яичник.
12. Corpus luteum - желтое тело.
13. Uterus - матка.
14. Fetal part of placenta - плодная часть плаценты.
15. Maternal part of placenta - материнская часть плаценты.
16. Mammary gland - молочная железа.

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