Ministry of Education and Science of the Kyrgyz Republic
Osh State University
Federal State-Funded Educational Institution of Higher Education
"Voronezh State Medical University named after N.N. Burdenko"
of the Ministry of Health of the Russian Federation

Department of Anatomy, Histology and Normal Physiology
Department Histology

TRAINING MANUALS – ALBUM

in Human Histology
for practical classes, independent self work and self-preparation
for the specialty "560001-General Medicine"

Osh-Voronezh, 2023

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Reviewer: Pavlov A.V. Head of the Department of Histology, Cytology and Embryology of the Federal State Budgetary Educational Institution of Higher Education "Yaroslavl State Medical University" of the Ministry of Health of the Russian Federation, Doctor of Medical Sciences, Professor, Honored Worker of the Higher School of the Russian Federation.

Recommended by the Central problem educational and methodic committee of histology, cytology, embryology to use in education.

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"Training manuals album ..." contains recommendations in preparation studying and drawing, situational tasks, current test control questions, test control questions to remaining knowledge, tables and scheme-pictures for student's self work.

Name HABIBAA SHEIK DAWOOD

Course, faculty, No of group

No of microscope

RECOMMENDED EDUCATIONAL-METHODICAL LITERATURE

BASIC

1. Junqueira's Basic Histology/ Text and Atlas/ Anthony L. Mescher – 14th ed. – New York, USA: ISBN 978-1-25-925098-9 MHID 1-25-925098-9. p. 560.
2. Gartner, L. P. Textbook of Histology / L. P. Gartner. – 4-th ed. – Philadelphia, PA : Elsevier, 2017. – ISBN 9780323355636. – URL: http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=1287508. – Text: electronic.
3. Histology/ Color Atlas and textbook/ Leslie P. Gartner, James L. Hiatt (6th ed.)
4. Inderbir Singh's textbook of Human Histology/ Neelam Vasudeva, Sabita Mishra/ Color Atlas and practical guide (7th ed)

Additional

5. Histology: a Text and Atlas With Cell and Molecular Biology / M.H. Ross, G.I. Kaye, P. Wojciech. – 4 edition. – Philadelhia: LIPPINCOTT WILLIAMS & WILKINS, 2003. – 864p. + 1CD-Rom. – ISBN 0-683-30242-6.
6. Singh I. Textbook of Human Histology: With Colour Atlas / I. Singh, J. Brothers. – 5 ed. – New Delhi: Medical Publisher (P) LTD, 2006. – 365 c. – ISBN 81-8061-809-9.
7. Yushkantseva, S. A brief atlas of histology, cytology and embryology with 279 color illustrations = Гистология, цитология и эмбриология / S. Yushkantseva, B. Bykov. – SPb: П-2, 2007. – 120 p. – ISBN 978-5-93893-403-0.
8. Histology/ textbook. Eduardo G. Gonzales, M.D. (5th ed.)
9. Human histology/ Alan Stevens, James Lowe. (3rd ed.)

The Instructions
of the Anatomy, Histology and Normal physiology department for the students to follow

1. Students have to handle the Department property, microscopes and other equipment with care and caution
2. Students have to follow a dress-code: students wear medical gowns and cap
3. Students are to come to the lectures and the practical class on time
4. Students are to have TRAINING MANNUALS – ALBUM and colored pencils for drawing slides at every practical class
5. to get the permission for current control, milestone control and exam control, students are to attend all lectures and practical classes and perform correctly all tasks in the workbook
6. If students are missing at practical classes, they will have to take a permission and work off a missed class within a few time.

I will read the Instruction of the Department_____
(signature)

SECTION I. Histological equipment

Rules for working with microscopes

The purpose of the lesson

Is able and willing to define the role of histology, cytology and embryology in practice, knows the methods of microscopy of histological preparation and stages, principles of preparation of histological preparations and educational literature. Apply the study material in his/her future profession

1. It is necessary to dust microscope optical parts with the napkin before you start working.
2. Mount the microscope on the desk edge and have it ready for work:
   a) Place the low magnifying objective at the distance of 1 – 1,5 cm from the desk;
   b) Set the light by the concave mirror side from the artificial light source;
   c) Looking into the ocular with one eye (more convenient with the left one) without shutting another, illuminate equally and intensively a vision site by the mirror.
3. Place a micropreparation on the objective table with the covering glass being up (pay a special attention to it). The micropreparation should be shifted holding thumb and index finger on the edges. Fix the position on the table with the third finger.
4. Observe the preparation and concentrate the object studied in the site vision center.
5. While turning from low to high magnification it is necessary:
   a) to raise the microscopic cone, rotating microscrew towards yourself (~0,5 cm from the objective table), controlling it visually;
   b) to change the objective turning revolver till the crack;
   c) to lower the cone so that the objective almost contacts with the micropreparation by slow screw forward rotation;
   d) to look into the ocular and rotate the screw slowly towards yourself until an image of the object appears in the vision site;
   e) in the presence of the condenser it is possible to supply a better illumination of preparation at high magnification.
6. While microscoping the left hand should be constantly placed on the screw in order to correct the depth of image rotating the screw backward and forward.
7. Having studied the structures in the site vision at high magnification it's necessary to choose and draw a proper fragment.
8. When you complete the work don't remove the preparation from under the high magnifying objective without raising the cone upwards (no more than 0,5 cm). The preparation is to be removed at low magnification.
9. It is prohibited to unscrew any parts of microscope. In case of microscope disrepair address the tutor.

COMMON HISTOLOGICAC STAINS AND REACTIONS

Reagent	Results
Hematoxylin	**Blue: nucleus, acidic regions of cytoplasm, cartilage matrix**
Eosin	**Pink: basic region of the cytoplasm, collagen fibers**
Masson's trichrome	**Dark blue: nuclei red: muscle, keratin, cytoplasm** **Light blue:mucinogen, collagen**
Orcein	**Brown: elastic fibers**
Weigert's elastic stain	**Blue: elastic fibers**
Silver stain	**Black: reticular fibers**
Iron hemotoxylin	**Black: striations of muscle, nuclei, erythrocytes**
Alcian blue – Van Gison	**Blue: mucocytes; red: collagen**
Periodic acid-Schiff	**Magenta: glycogen and carbohydrate rich molecules**
Wright and Giemsa stains	**Used for differential staining of blood cells** **Pink: erythrocytes, eosinophil granules;** **Purple: leukocyte nuclei, basophil granules;** **Blue: cytoplasm of monocytes and lymphocytes**

TEST CONTROL QUESTIONS.

1. In preparing tissue for routine light microscopic study, which procedure immediately precedes clearing the specimen with an organic solvent?

a. **Dehydration;** b. Fixation; c. Staining; d. Clearing; e. Embedding.

2. Which of the following staining procedures relies on the cationic and anionic properties of the material to be stained?

a. Enzyme histochemistry; b. Periodic acid-Schiff reaction; **c. Hematoxylin** & eosin staining; d. Metal impregnation techniques.

3. In a light microscope used for histology, resolution and magnification of cells are largely dependent on which component?

a. Condenser; **b. Objective** lens; c. Eyepieces or ocular lenses; d. Specimen slide; e. The control for illumination intensity.

4. Cellular storage deposits of glycogen, a free polysaccharide, could best be detected histologically using what procedure?

a. Autoradiography; b. Electron microscopy; c. Enzyme histochemistry; d. Hematoxylin & eosin staining; **e. Periodic** acid-Schiff reaction

5. Adding heavy metal compounds to the fixative and ultrathin sectioning of the embedded tissue with a glass knife are techniques used for which histological procedure? a. Scanning electron microscopy; b. Fluorescent microscopy; c. Enzyme histochemistry; d. Confocal microscopy; **e. Transmission** electron microscopy

6. Resolution in electron microscopy greatly exceeds that of light microscopy due to which of the following?

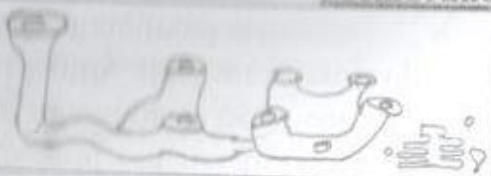
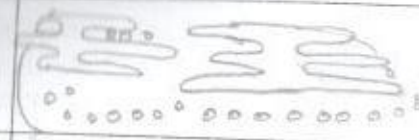
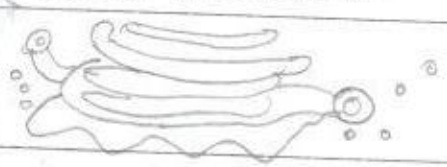
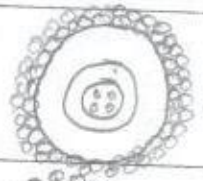
a. **The wavelength** of the electrons in the microscope beam is shorter than that of the beam of light.
b. The lenses of an electron microscope are greatly improved quality.
c. For electron microscopy the tissue specimen does not require staining.
d. An electron microscope can be much more finely controlled than a light microscope.

Topic: Organels and inclusions.

Date:

Class self work.

Table 1. Morphofunctional cell cytoplasm organelles characteristics.

Organelle name	Light microscopy data (or chemical equivalent)	Electronmicroscopy data	Functions	Renewal
Membranous organelles (to draw)				
1. Endoplasmic reticulum a) smooth		It is a tube like structure located near the cell periphery	• Protein Synthesis • Protein transport • Steroid Synthesis • Calcium Storage	
b) granular		It is a series of connected flattened sacs having several ribosomes	The rough Endoplasmic reticulum contains ribosome, make proteins	
2. Golgi complex		A series of flattened stacked pouch is called Cisternae.	Helps process and package protein and lipid molecule.	
3. Mitochondria		Surrounding by a double membrane system consisting of outer & inner membrane	To produce the chemical energy required to fuel biochemical reaction in cell.	
4. Lysosomes		The lysosome structure is bounding a phosphate bilayer.	They break down excess or work out cell parts.	
5. Peroxysomes		It is a single membrane bound vesicles found in most eukaryotes	Breakdown of fatty acids, detoxification processes, Synthesis of certain lipids.	

Extracurricular self work.

Table 16. Classification of nervous cells (neurons

On a structure	
On function	
On transmitter	

Table 17. Classification of neurogli

	Macroglia			Microglia
	astroglia	oligodendroglia	ependimoglia	
Variants				
Topography				
Functions				

TEST CONTROL QUESTIONS

1. Name the source of the development of the anterior epithelium of the cornea of the eye:
a) mesoderm; b) neural tube; c) mesenchyme; d) ectoderm.
2. What is the source of the development of the cornea's own substance?
a) mesoderm; b) endoderm; c) mesenchyme; d) ectoderm.
3. Name the source of the development of the posterior epithelium of the cornea of the eye:
a) ectoderm; b) neural tube; c) mesenchyme; d) mesoderm.
4. Which of the listed types of epithelium belongs to the anterior epithelium of the cornea of the eye?
a) simple squamous; b) simple cuboidal;
c) pseudostreatifide columnar; d) streatified non-corneating.
5. What is the receptor apparatus of the eye?
a) cornea; b) sclera; c) the lens; d) the retina.
6. What applies to the accommodation apparatus of the eye?
a) retina; b) cornea; c) the iris; d) the sclera.
7. The anterior part of the vascular membrane, which is a pigmented disk with a hole in the center(pupil) is called:
a) the cornea; b) the anterior chamber of the eye;
c) the iris; d) the actual vascular membrane.
8. The ciliary muscle, ciliary processes with vessels, externally covered with the ciliary part of the retina are:
a) pupil; b) iris; c) the ciliary body; d) the lens.
9. How many neurons make up the chain of the receptor apparatus of the eye?
a) one; b) two; c) three; d) four.
10. Which of the listed cells will tilt to the photoreceptors of the retina?
a) bipolar; b) multipolar; c) pigmented; d) cones.
11. Which germ cells give rise to cone-bearing and rod-bearing cells?
a) myoblasts; b) melanoblasts; c) neuroblasts; d) fibroblasts.
12. Specify the neurites of which retinal cells form a layer of nerve fibers? a) amacrine; b) horizontal; c) associative; d) ganglionic.
13. Which organoid of special significance in melanocyte cells causes the absorption of 85-90% of the lightentering the eye?
a) phagosomes; b) microvilli; c) melanosomes; d) tonofibrils.
14. Which vitamin is a necessary component of the visual pigment rhodopsin?
a) vitamin B; b) vitamin PP; c) vitamin A; d) vitamin D.
15. Which layer of the retina in the central fossa (the place of the best vision) does not move apart for the course of light rays tothe layer of cones?
a) ganglion; b) external granular; c) internal granular; d) external fusiform.
16. A person has impaired twilight vision ("chicken blindness"). Which cells' function is impaired?
a) cones; b) sticks; c) amacrine; d) horizontal.
17. Name the number of cells of the receptor layer in the olfactory organ:
a) one; b) two; c) three; d) four.
18. What special organoid do olfactory cells have?
a) cilia; b) flagella; c) microvilli; d) tonofibrils.
19. A person has a damaged mucous membrane covering the upper part of the middle shell of the nasal cavity.
The peripheral part of which analyzer is destroyed in this case?
a) taste; b) sense of smell; c) hearing; d) balance.
20. What type of receptor is the taste organ?
a) baroreceptor; b) chemoreceptor;
c) thermoreceptor; d) mechanoreceptor.
21. As a result of accidental use of acetic acid, the taste buds of the anterior part of the tongue atrophied in the patient. What taste irritations are lost in this case?
a) sweet; b) salty; c) bitter; d) sour.
22. A person has affected taste buds at the root of the tongue, what taste sensations are preserved (violated?)?
a) sweet; b) bitter; c) sour; d) salty.
23. In which part of the ear is the cortical organ?

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