IMMANUEL KANT BALTIC FEDERAL UNIVERSITY
DEPARTMENT OF FUNDAMENTAL MEDICINE

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ANATOMY: VEGETATIVE NERVOUS SYSTEM. SENSORY ORGANS. ENDOCRINE SYSTEM

Methodological recommendations
for students of medicine

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The manual is prepared according to requirements of the working program of the discipline “Anatomy” and contains methodical indications for the sections: Vegetative nervous system, sensory organs, endocrine system according to the existing curriculum. The manual is intended for the English-speaking students of medical faculty studying on specialties 31.05.01 “General medicine”.

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Topic 1
GENERAL INFIRMATION ABOUT THE VEGETATIVE NERVOUS SYSTEM. SYMPATHETIC AND PARASYMPATHETIC DIVISIONS OF THE AUTONOMIC NERVOUS SYSTEM. VEGETATIVE INNERVATION OF THE INTERNAL ORGANS

INTRODUCTION TO THE TOPIC

Autonomic nervous system (ANS) innervates internal organs (viscera), smooth muscle, cardiac muscle, various endocrine and exocrine glands, adipose tissue, this nervous system influences the activity of most tissues and organ systems in the body. It controls all the vital functions, like heart rate, breathing, blood pressure, digestion without any conscious effort of an individual, and is thus referred to as involuntary. Healthy organ systems can maintain a balance (autonomic tone) between sympathetic and parasympathetic activity.

Failure of the autonomic tone leads to various dysfunctions of internal organs. There are many different classes of drugs that can affect the parasympathetic and sympathetic nervous system, that is why this topic is important for doctors of any profile. Knowledge of autonomic nervous system is important as it prepares the student for further studies in therapeutics, pathophysiology and pharmacology.

Before studying the topic, you should know:

1. Blood vessels and peripheral nerves.
2. Internal organs.
3. Central nervous system centers.
4. Cranial nerves: III, VII, IX, X.
5. Heart.

SELF-STUDY GOALS

After independently studying the topic, the student should understand the special structural features of the vegetative nervous system: position of its centers in the brain and spinal cord; classification, significance and location of the ganglions; reflex arch components. The student should know the difference between the VNS and the somatic nervous system.

Student should be able to differentiate the parasympathetic and sympathetic divisions of the ANA.

Student should understand the autonomic reflexes, parasympathetic and sympathetic innervation of internal organs, heart, glands.

TOPIC CONTENT

- General classification of the nervous system: features of the somatic and vegetative nervous system (VNS), their divisions.
- Morphological elements of the VNS.
- Significance of the vegetative nervous system.
- The unity of the nervous system and the differences of VNS from the somatic nervous system.
- Concept of balance (homeostasis) and how it is controlled through the two divisions of the autonomic nervous system.
- Contrast the somatic and visceral reflex arches.
- The neurotransmitters and receptors involved in preganglionic and postganglionic neurons of the VNS.
- Sympathetic reflex arch components (position of the receptor, bodies of the 1^{st}, 2^{nd}, 3^{rd} neurons, ganglions, nerve fibers (pre- and postganglionic), neurotransmitters, effectors).
- Organ-specific effects of parasympathetic and sympathetic stimulation.
- Sympathetic nervous system centers, position of the nuclei and ganglions elements, fibers, effectors.
- Sources of the visceral organs sympathetic innervation.
- Truncus sympathicus: localization and number of ganglions, nerves; white and gray rami communicantes, nervous plexuses, zones of innervation.
- Parasympathetic nervous system centers, position of the nuclei and ganglions elements, fibers, effectors.
- Parasympathetic reflex arch components (position of the receptor, bodies of the 1^{st}, 2^{nd}, 3^{rd} neurons, ganglions, nerve fibers (pre- and postganglionic), neurotransmitters, working organs).
- Sources of the visceral organs parasympathetic innervation.
- Suprasegmental vegetative centers (location in the brain, significance).
- The enteric (metasympathetic) nervous system.
- Sympathetic and parasympathetic innervation: salivary glands, lacrimal gland, oral cavity, nasal cavity, pharynx, larynx, trachea, bronchi and lungs, oesophagus, heart, liver, stomach, small intestine, colon, kidneys, pelvic organs (uterus, ovaries, bladder, prostate), external male and female genitalia, sweat glands, blood vessels, soma.

• Sources of parasympathetic and sympathetic innervation of viscera and soma.

METHODOLOGICAL RECOMMENDATIONS FOR STUDYING THE MATERIAL

Activity	Step Description
Read the introduction to the topic	—
Study the corresponding section in literature sources	The study of the topic is accompanied by a demonstration of structural details on a table and diagram
Draw a diagram of the corresponding reflex arc in your notebook	Use red color pencil for drawing the motor structures, blue one — for the sensory and green one — for the vegetative structures
Revise the openings, channels, grooves associated with the study of a given nerve	The study of the topic is accompanied by a demonstration of structural details on the models and preparations
Describe the studied nerve	While describing the nerve, check the following: 1) English and Latin names of the nerve; 2) functional characteristics (sensory, motor, sympathetic, parasympathetic, mixed); 3) location of the nuclei (CNS region), their name and functional characteristics; 4) ganglions; 6) pre- and postganglionic fibers; 7) branches of the nerve: localization and zone of innervation
Write down new Latin terms	Put down new Latin terms in your notebook
Check your knowledge with self-control questions	Answer the questions given in the assignment

QUESTIONS FOR SELF-CONTROL

1. List the centres of the autonomic nervous system. Where is each of them located?
2. What tissues and organs have vegetative innervation?
3. Compare and contrast the vegetative and somatic nervous systems.
4. Differentiate between visceral and somatic reflex arch, draw these reflex pathways.

5. Describe the location and significance of the ANS centres.

6. Enumerate the formations of the peripheral part of the VNS.

7. Where are situated the segmental and suprasegmental centres of the PNS and SNS? Explain their functions.

8. Where are the bodies of the 1st, 2nd and 3rd neurons of the sympathetic reflex arch located?

9. Where are the bodies of the 1st, 2nd and 3rd neurons of the parasympathetic reflex arch located?

10. What are the effects of the vegetative nervous system on the organs?

11. What types of vegetative ganglions do you know?

12. What are the functions of the vegetative ganglions? Give the ganglions classification.

13. Describe the differences between the preganglionic and postganglionic nerve fibres.

14. What are the white and grey rami communicantes?

15. Give the definition of the sympathetic (SNS) and parasympathetic (PNS) parts of the vegetative nervous system.

16. Describe the function and differences between SNS and PNS.

17. Which organs are devoid of parasympathetic innervation? sympathetic innervation?

18. What is its functional purpose of the metasympathetic part of the VNS?

19. What is included in the central part of the sympathetic nervous system?

20. What is included in the peripheral part of the sympathetic nervous system?

21. What structures form the truncus sympathicus?

22. What prevertebral ganglions do you know?

23. Describe the truncus sympathicus anatomy (name, localization and number of ganglia, nerves arising from the right and left sympathetic trunk).

24. Describe the location of the superior cervical ganglion; name its branches; describe the structure of the internal carotid plexus. What organs are supplied by the branches of this ganglion?

25. Describe the location of the middle cervical ganglion; name its branches. What organs are supplied by the branches of this ganglion?

26. Describe the location of the cervicothoracic ganglion; name its branches. What organs are supplied by the branches of this ganglion?

27. Describe the branches of the thoracic ganglia; how are the nervus splanchnicus major and minor formed? What organs are supplied by the branches of the thoracic ganglia and by the splanchnic nerves?

28. Describe the branches of the lumbar ganglia. What organs do the branches of these ganglia innervate?

29. Describe the branches of the sacral, coccygeal ganglia. What organs do the branches of these ganglia innervate?

30. Give the information about the plexus aorticus abdominalis: ganglia, nerves, secondary autonomic nervous plexuses, visceral organs that innervated by these plexuses.

31. Give the information about the plexus hypogastric superior and inferior. What viscera do these plexuses innervate?

32. Enumerate the elements of the parasympathetic central and peripheral parts.

33. Describe the types, location and functions of parasympathetic vegetative ganglions.

34. What is the general action of the parasympathetic nervous system to the organism?

35. Which nuclei form the mesencephalic and ponto-bulbar part of the PNS?

36. Enumerate the parasympathetic ganglia of the cranial nerves and describe their location. Explain how the pre- and postganglionic fibres of these ganglia are formed. What organs are supplied by the postganglionic fibres from these ganglia?

37. Describe the parasympathetic structures of the sacral division. What organs receive the parasympathetic innervation from the sacral part?

38. Describe dual innervation of the eyeball, major salivary glands, larynx, pharynx, oesophagus, bronchi, heart, stomach, intestine, urinary bladder, reproductive organs. Explain the sympathetic and parasympathetic effects on this organs.

39. Which division of the nervous system increases digestive and urinary activity?

40. Which division of the nervous system decreases digestive and urinary activity?

41. What plexuses do provide innervation of thoracic cavity organs?

42. What plexuses do provide innervation of the abdominal organs?

43. What plexuses do provide innervation of the pelvic organs?

44. What viscera have no a double innervation?

Written task:

1. Draw the innervation (sympathetic and parasympathetic) of the following organs:

— sphincter and dilator of pupil;
— parotid gland;
— sublingual gland / submandibular gland;
— heart musculature;
— stomach;
— urinary bladder.

2. Complete the table

Effects of VNS

Systems and organs	Sympathetic NS	Parasympathetic NS
Pupil		
Lacrimal gland		
Salivary glands		
Contraction of heart		
Heart rhythm		
Blood vessels		
Heart vessels		
Frequency of breath		
Bronchi		
Sweat glands		
Adrenal glands		
Reproductive organs		
Uterus		
Digestive tract		
Urinary bladder		
Sphincters		

PRACTICAL SKILLS

Skull

1. Facial canal, *canalis facialis*; лицевой канал.
2. Superior orbital fissure, *fissure orbitalis superior*; верхняя глазничная щель.
3. Hiatus of lesser petrosal nerve canal, *hiatus canalis nervi petrosi minoris*; расщелина малого каменистого нерва.
4. Groove for greater petrosal nerve, *sulcus canalis nervi petrosi majoris*; борозда большого каменистого нерва.
5. Petrotympanic fissure, *fissure petrotympanica*; каменисто-барабанная щель.
6. Lacerum foramen, *foramen lacerum*; рваное отверстие.
7. Pterygoid canal, *canalis pterygoideus*; крыловидный канал.
8. Hiatus of greater petrosal nerve canal, *hiatus canalis nervi petrosi majoris*; расщелина большого каменистого нерва.

9. Jugular foramen, *foramen jugulare*; яремное отверстие.

10. Groove for lesser petrosal nerve, *sulcus canalis nervi petrosi minoris*; борозда малого каменистого нерва.

11. Petrosquamous fissure, *fissure petrosquamosa*; каменисто-чешуйчатая щель.

12. Pterygopalatine fossa, *fossa pterygopalatine*; крыловидно-небная ямка.

13. Tympanic canaliculus, *canaliculus tympanicus*; барабанный каналец.

Brain

1. VII cranial nerve, *nervus facialis*; лицевой нерв.
2. IX cranial nerve, *nervus glossopharyngeus*; языкоглоточный нерв.
3. X cranial nerve, *nervus vagus*; блуждающий нерв.
4. III cranial nerve, *nervus oculomotorius*; глазодвигательный нерв.
5. Spinal ganglion, *ganglion spinale*; спинномозговой узел.
6. Midbrain, *mesencephalon*; средний мозг.
7. Pons, *pons*; мост.
8. Brain stem, *truncus cerebri*; ствол головного мозга.
9. Medulla oblongata, *medulla oblongata*; продолговатый мозг.
10. Sympathetic trunk, *truncus sympathicus*; симпатический ствол.

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4. *Gray's* Atlas of Anatomy / L. Richard, A. Drake, W. Vogl, A. W. M. Mitchell et al. — 2nd International edition. — Philadelphia : Elsevier, 2015. — 626 p., ill.

5. *Lecture* material.

Topic 2
ANATOMY OF ANALYZERS. ORGAN OF VISION. ORGAN OF HEARING AND BALANCE

INTRODUCTION TO THE TOPIC

The organ of vision is the most important tool for learning about the external world. The main information from the outside world enters the brain through this analyzer. I. P. Pavlov attributed enormous cognitive power to the visual analyzer. Its functions underlie all human labor and creative activity. Signals entering the cerebral cortex are analyzed and synthesized into a visual image. The eye is a distant analyzer of the highest order. He is characterized by spatial perception of depth, movement of objects, their distance, physicality. That is why the visual act has always been enigmatic and mysterious.

There are a number of diseases that do not threaten with death, but deprive a person of the joy of visually perceiving the wonderful world of sun and colors around us, and then ophthalmology comes to the rescue.

For successful diagnostics and treatment of the eye diseases it is necessary to know the eye structure. To treat the diseases of the auxiliary structures of the eye, a doctor should know their anatomy. In ophthalmologic practice the inflammation of the conjunctiva, obstruction of lacrimal ducts, strabismus are often met.

The knowledge of the external and middle ear anatomy is necessary in medical practice. The anatomy of the middle ear is also needed to understand the biomechanics of the sound wave transmission in the external and middle ear. The connections of middle ear with the other cavities show the possible ways of pus dissemination in case of the middle ear inflammation. The inflammation of the middle ear and surrounding areas often requires surgical intervention; this is impossible to do without the knowledge of the external and middle ear anatomy.

The inner ear contains the peripheral parts of statokinetic and auditory analyzers. The damage to the inner ear often leads to hearing loss and impaired motor coordination and balance. The treatment of the diseases of all the ear parts requires a good knowledge of inner ear anatomy and topography.

Before studying the topic, you should know:

1. The orbital cavity: superior, inferior, medial and lateral wall structures.
2. The orbital openings: canals, fissures, foramens and their communications.
3. The temporal bone: parts, fissures, structure, cavity, canals, canalicles.

4. Visual analyser pathway.
5. Vestibular analyzer pathway.
6. Auditory analyzer pathway.

SELF-STUDY GOALS

After independently studying the topic, the student should know: the characteristic of the eyeball three layers — fibrous, vascular and retina; eyeball internal nucleus — vitreous body, lens, aqueous humor; circulation of the aqueous fluid; process of accommodation; process of eye adaptation; the structure of the eyelids and conjunctiva; the extraocular muscles (location, action, innervation); the structure and function of the lacrimal apparatus.

The student should know: the anatomy of the outer and middle ear, be able to demonstrate the components of the outer and middle ear on a preparation; know the anatomy of the outer ear on a living person; the topography of the inner ear and temporal bone, the location of the bony and membranous labyrinths, sections of the bony labyrinth, the structure of the semicircular canals, cochlea, parts of the membranous labyrinth, auditory and statokinetic pathways.

TOPIC CONTENT

- General characteristics of the eyeball: a) shape; b) topography; c) poles of the eyeball. Optical and internal ocular axis, visual line, meridians, equator of the eyeball. Compare the dimensions of the internal ocular axis in a normal eye with the anatomical axes in nearsighted and farsighted people. The concepts are “myopic” and “hypermetropic” and methods of correcting their vision, i. e. what glasses these people need.
- The layers of the eyeball.
- The fibrous membrane: structure and function of its parts — sclera, cornea, Schlemm’s canal.
- The choroid — function, parts: the choroid itself, the ciliary body, the iris. It is important to know that the choroid itself has the ability to move, as a result of which a slit-like lymphatic space is formed between it and the fibrous membrane and that this ability allows the choroid itself to move forward, towards the ciliary body.
- Ciliary body (ciliary circle, ciliary processes, muscles of the ciliary body).
- Iris, pupil.
- When studying the retina, the function, topography, parts — anterior, posterior — are sequentially considered; optic disc (blind spot); macula (yellow spot) — the place of greatest visual acuity.

• Light refractive media: a) vitreous body; b) lens; c) aqueous humor, d) cornea.

• The causes and mechanisms of changes in the curvature of the lens, how aqueous humor is produced and through what formations it flows (it is produced by the ciliary processes, and flows sequentially through the Petitt's canal, posterior chamber, pupil, anterior chamber, fountain spaces, Schlemm's canal, vena vorticosa, ophthalmic veins).

• Extraocular muscles: attachment, action, innervation (rectus superior, inferior, lateralis, medialis; obliquus superior, inferior).

• Eyelids: layers, tarsal plates, glands, muscles, functions.

• Conjunctiva: palpebral part, bulbar part, conjunctival sac. Functions.

• Lacrimal apparatus — lacrimal gland, lacrimal lake, lacrimal canalicles, lacrimal sac, nasolacrimal duct). Functions of the lacrimal fluid.

• Visual analyzer: retina, optic nerve, chiasma, tract, subcortical visual centers: pulvinar thalami, corpus geniculatum laterale, colliculus superior of lamina tecti, capsula interna, occipital lobe (sulcus calcarinus).

• External ear — auricula (divisions, function), meatus acusticus externus (parts, glands, functions), membrana tympani (layers, parts, function).

• Middle ear (cavitas tympani) — walls of the tympanic cavity, their formations.

• Contents of the cavitas tympani — auditory ossicles: malleus, incus, stapes, their function; auditory tube; structure of the mastoid process (cave, cells); m. stapedius, m. tensor tympani.

• Biomechanics of sound wave transmission through the outer and middle ear.

• The structure of the bony and membranous labyrinths, the differences in their structure.

• Internal ear, bony labyrinth. Cochlea: a) spiral bone plate; b) scala vestibulae; c) scala tympani; d) cochlear aqueduct. Semicircular canals (legs, openings). Vestibule (openings, resessuses).

• Internal ear, membranous labyrinth: a) endolymphatic duct; sac; b) vestibular aqueduct; c) connecting duct; d) cochlear duct (organon spirale); e) semicircular ducts; f) sacculus and utriculus.

• Statokinetic analyzer: maculae, cristae, vestibular ganglion; superior, lateral, medial, inferior nuclei, motor nuclei of the spinal cord, motor nuclei of the nerves of the eye muscles; reticular formations; thalamus; parietal and temporal lobes, vagus and glossopharyngeal cranial nerves, connection with them.

• Auditory analyzer (sound-conducting and sound-perceiving apparatus), the circuit of sound perception: the auricle, eardrum, auditory ossicles, perilymph and endolymph, Corti's organ, cochlear ganglion, dorsal and ventral nuclei, midbrain, medial geniculate body, superior temporal gyrus.

METHODOLOGICAL RECOMMENDATIONS FOR STUDYING THE MATERIAL

Activity	Step Description
Read the introduction to the topic and self-study goals	—
Study the corresponding section in literature sources	The study of the topic is accompanied by a demonstration of details of the structure on a preparation and a model
Draw a diagram of the structure of the sense organ in your notebook	It is better to draw the elements of the sense organ by pencils of different colors
Revise the studied material while showing bone formations on the preparations	When revising orally, check the following: 1) English and Latin name of an organ or its part; 2) its functional role; 3) consistent description of the details of the structure; 4) the relationship between the departments and parts of a given sense organ
Write down new Latin terms	Write the terms in your notebook (see the list of Practical skills)
Check your knowledge with self-control questions	Answer the questions given in the assignment

QUESTIONS FOR SELF-CONTROL

1. Where are the anterior and posterior poles of the eye?
2. What are the anatomical, external and internal axes of the eyeball? What are their normal lengths?
3. What is the visual axis of the eyeball?
4. Name the coats of the eyeball, beginning from the exterior, in order.
5. What parts does the fibrous coat of the eye have?
6. Which part of the fibrous membrane is transparent? Why?
7. Where is the Schlemm's canal (sinus venosus sclerae) located?
8. What parts is the vascular coat divided into?
9. What is the function of the sclera? cornea? sinus venosus sclerae?
10. What function does the choroid perform?
11. What function do the meridional, circular muscle fibers of the ciliary body perform?

12. Describe the function of the ciliary processes and their location.
13. What is the pupil?
14. What determines the “color” of the eye?
15. What muscles are there in the iris? What function do they perform?
16. Describe the function of the pupil.
17. Where are the dilator and sphincter muscles located?
18. Explain the process of eye adaptation, eye accommodation.
19. Where is the angulus iridocornealis located?
20. Where is located pectinate ligament? What spaces are between its fibres? What is the function of this ligament?
21. Describe the function of the spaces in the pectinate ligament.
22. What parts does the ciliary body have?
23. What parts are distinguished in the retina by topographic and functional characteristics?
24. What function does the inner lining of the eyeball perform?
25. Describe the layers of the retina. What layer contains photoreceptive cells?
26. Describe the formation of the optic nerve.
27. What is the optic disc (blind spot)? How is it formed?
28. Describe the features of the cones and rods.
29. What is the macula lutea (yellow spot)?
30. What is Petitt’s canal? Where is it located?
31. Name in sequence the formations through which aqueous humor flows.
32. What is the accommodation? Describe its mechanism.
33. How does the contraction of the ciliary muscle affect the lens? How is the vision changed during this?
34. Name the accessory visual structures.
35. Describe the location and function of the orbital fat body.
36. Name the extraocular muscles, their attachment points and function.
37. How are eyelids constructed?
38. What is there on the free edge of the eyelids?
39. Which muscles close (open) the eyelids?
40. Describe the conjunctiva structures and functions.
41. What parts are distinguished in the conjunctiva?
42. Where is the conjunctival fornix?
43. Describe the localization of the lacrimal gland.
44. Describe the significance and structure of the lacrimal gland.
45. What is the tear duct formed by?
46. Where does the tear flow?
47. Where is the lacrimal sac located?
48. Where does the nasolacrimal duct open?
49. Where are the tears absorbed?
50. What parts does the external ear include?

51. What is the structure of the auricle?
52. What is the anatomy of the external acoustic meatus and eardrum?
53. What parts does the middle ear include?
54. What walls are in the tympanic cavity? Describe them.
55. What are the contents of the tympanic cavity?
56. Describe the ossicles and their connections, functions.
57. Describe the communications of the cavitas tympani.
58. Describe the functioning of the tensor tympani and stapedius muscles.
59. Where is the inner ear located?
60. What parts does the bony labyrinth include? Describe its components.
61. What parts does the membranous labyrinth include? Describe its components.
62. Explain the cochlea structures and functions.
63. Name the semicircular canals and their structural features.
64. What fills the space between the bony and membranous labyrinths?
65. What is the membranous labyrinth filled with?
66. What is the endolymphatic duct? Where does it go? How does it end?
67. Describe the elements of the stato-kinetic analyzer.
68. Describe the elements of the auditory analyzer.
69. Describe the elements of the visual analyzer.
70. What are the biomechanics of sound wave transmission through the outer and middle ear?
71. Where are the ampullar crests located? Describe their functioning.
72. Describe the structure, location and function of the spiral organ.
73. Describe the sound conduction in the inner ear.
74. Describe the functioning of the vestibular apparatus.

Written task:
1. Draw the Organ of Corti.
2. Fill in the table

Labyrinth	Part of the labirynth	Anatomical structures located in them

PRACTICAL SKILLS

Organ of vision

1. Fibrous layer, *tunica fibrosa bulbi*; фиброзная оболочка глаза.
2. Cornea, *cornea*; роговица.
3. Sclera, *sclera*; склера.

4. Venous sinus of sclera, *sinus venosus sclerae*; венозная пазуха склеры.
5. Vascular layer, *tunica vasculosa bulbi*; сосудистая оболочка глаза.
6. Iris, *iris*; радужка.
7. Pupil, *pupilla*; зрачок.
8. Ciliary body, *corpus ciliare*; ресничное тело.
9. Ciliary processes, *processus ciliares*; ресничные отростки.
10. Corona ciliaris, *corona ciliaris*; ресничный венец.
11. Choroid, *choroidea*; собственно сосудистая оболочка.
12. Retina, *retina*; сетчатка.
13. Optic part of retina, *pars optica retinae*; зрительная часть сетчатки.
14. Ora serrata, *ora serrata*; зубчатый край.
15. Disc of optic nerve, *discus nervi optici*; диск зрительного нерва.
16. Yellow spot, *macula lutea*; желтое пятно.
17. Blind spot, *macula caeca*; слепое пятно.
18. Anterior chamber of eyeball, *camera anterior bulbi*; передняя камера глаза.
19. Posterior chamber of eyeball, *camera posterior bulbi*; задняя камера глаза.
20. Lens, *lens*; хрусталик.
21. Vitreous body, *corpus vitreum*; стекловидное тело.
22. Iridocorneal angle, *angulus iridocornealis*; радужно-роговичный угол.
23. Superior rectus muscle, *musculus rectus superior*; верхняя прямая мышца.
24. Inferior rectus muscle, *musculus rectus inferior*; нижняя прямая мышца.
25. Lateral rectus muscle, *musculus rectus lateralis*; латеральная прямая мышца.
26. Levator palpebrae superior muscle, *musculus levator palpebrae superior*; мышца поднимающая верхнее веко.
27. Medial rectus muscle, *musculus rectus medialis*; медиальная прямая мышца.
28. Superior oblique muscle, *musculus obliquus superior*; верхняя косая мышца.
29. Inferior rectus muscle, *musculus obliquus inferior*; нижняя косая мышца.
30. Lacrimal sac, *saccus lacrimalis*; слезный мешок.
31. Nasolacrimal canal, *canalis nasolacrimalis*; носослезный канал.
32. Lacrimal gland, *glandula lacrimalis*; слезная железа.

Organ of hearing

1. Helix, *helix*; завиток.
2. Antihelix, *antihelix*; противозавиток.
3. Tragus, *tragus*; козелок.

4. Antitragus, *antitragus*; противокозелок.

5. Auricular lobule, *lobulus auricularis*; мочка уха.

7. Concha of auricle, *concha auriculae*; ушная раковина.

8. External acoustic porus, *ostium acusticum externum*; наружное слуховое отверстие.

9. External acoustic meatus, *meatus acusticus externus*; наружный слуховой проход.

10. Tympanic membrane, *membrana tympani*; барабанная перепонка.

11. Mastoid antrum, *antrum mastoideum*; сосцевидная пещера.

12. Mastoid cells, *cellulae mastoideae*; сосцевидные ячейки.

13. Malleus, *malleus*; молоточек.

14. Stapes, *stapes*; стремечко.

15. Incus, *incus*; наковальня.

16. Tensor tympani muscle, *musculus tensor tympani*; мышца напрягающая барабанную перепонку.

17. Stapeedius musle, *musculus stapedius*; мышца стремечка.

18. Tympanic opening of auditory tube, *ostium tympanicum tubae auditivae*; барабанное отверстие слуховой трубы.

19. Pharyngeal opening of auditory tube, *ostium pharyngeum tubae auditivae*; глоточное отверстие слуховой трубы.

20. Vestibule of bony labyrinth, *vestibulum*; преддверие лабиринта.

21. Oval window, *fenestra vestibuli*; окно преддверия.

22. Round window, *fenestra cochleae*; окно улитки.

23. Anterior semicircular canal, *canalis semicircularis anterior*; верхний полукружный каналец.

24. Posterior semicircular canal, *canalis semicircularis posterior*; задний полукружный каналец.

25. Lateral semicircular canal, *canalis semicircularis lateralis*; латеральный полукружный каналец.

26. Cochlea, *cochlea*; улитка.

27. Modiolus, *modiolus*; стержень.

28. Spiral lamina of modiolus, *lamina spiralis ossea*; спиральная пластинка.

29. Scala vestibuli, *scala vestibuli*; лестница преддверия.

30. Scala tympani, *scala tympani*; барабанная лестница.

Tympanic cavity walls

1. Carotid wall, *paries caroticus*; соннная стенка.

2. Mastoid wall, *paries mastoideus*; сосцевидная стенка.

3. Jugular wall, *paries jugularis*; яремная стенка.

4. Labyrinthine wall, *paries labyrinthicus*; лабиринтная стенка.

5. Tegmental wall, *paries tegmentalis*; покрышечная стенка.

6. Membranous wall, *paries membranaceus*; перепончатая стенка.

Literature

1. *Human* anatomy : 2 vol. / M. Prives, N. Lysenkov, V. Bushkovich. — Moscow : Mir Publishers, 1985. — Vol. 2. — 439 p., ill.

2. *Textbook* of Human Anatomy. In 3 vol. Vol. 3. Nervous system. Esthesiology / L. L. Kolesnikov, D. B. Nikitiuk, S. V. Klochkova, I. G. Stelnikova. — Moscow : GEOTAR-Media, 2018. — 216 p.

3. *Sapin, M. R.* Textbook of human anatomy for medical students. Vol. 2 / M. R. Sapin, L. L. Kolesnikov, D. B. Nikitjuk. — 2nd ed. — Moscow : New Wave Publishing Agency, 2019. — 480 p.

4. *Gray's* Atlas of Anatomy / L. Richard, A. Drake, W. Vogl, A. W. M. Mitchell et al. — 2nd International edition. — Philadelphia : Elsevier, 2015. — 626 p., ill.

5. *Lecture* material.

Topic 3
THE SKIN AND ITS DERIVATIVES. ENDOCRINE SYSTEM

INTRODUCTION TO THE TOPIC

The skin is the largest organ in the body and covers the body's entire external surface. The skin serves as the body's initial barrier against pathogens, UV light, and chemicals, and mechanical injury. The knowledge of the anatomy and physiology of the skin is needed in the work of many specialists. Langer's Lines, also known as cleavage lines, are topological lines used to define the tension of the skin, corresponding to the alignment of collagen and elastic fibers in the reticular dermis. When surgical incisions are made along these lines, less scarring occurs.

Mammary glands are involved in secreting, synthesizing and delivering milk to a newborn baby for their optimal protection, nourishment and development. As female breast cancer is one of the most common cancers, it is important to know the anatomy and physiology of this gland.

The knowledge of endocrine gland anatomy and physiology allows doctors to assess its role in the regulation of homeostasis. Currently, doctors often come across the endocrine pathology. An expert doctor should know topography, anatomy and physiology of the endocrine system well.

Before studying the topic, you should know:

1. The anatomy of the internal organs.
2. The anatomy of the brain.
3. Vegetative innervation of the internal organs.
4. Blood supply of the head, brain, neck, thoracic, abdominal and pelvic organs.

SELF-STUDY GOALS

After independently studying the topic, the student should know: the structural and functional characteristic of three skin layer: the epidermis, dermis, and the hypodermis; anatomy of the hair, nails; structures and functions of the mammary glands.

Another aspect of the topic that the student has to be aware about includes the classification of endocrine glands by origin, morphofunctional features of the glands, anatomy and topography of individual glands, be able to show the glands, have an idea of the hyper- and hypofunction of the glands.

TOPIC CONTENT

- Morphofunctional features of the epidermis.
- Morphofunctional features of the dermis.
- Morphofunctional features of the hypodermis.
- Morphofunctional features of the hair.
- Morphofunctional features of the nails.
- Three sections of the mammary glands — skin (areola, nipple), stroma (fatty stroma, fibrous stroma), parenchyma (lobes and lactiferous ducts).
- Classification of endocrine glands.
- Morphofunctional features of the endocrine glands.
- Pituitary gland: topography, structure, hypothalamic-pituitary system, hormones:
  - anterior lobe (adenohypophysis) — STG, ACTG, TTG, FSG, LG, LTG;
  - tuberous part;
  - intermediate part — intermedin (melanocyte-stimulating hormone);
  - neurohypophysis — vasopressin, oxytocin.
- Pineal gland: topography, structure, hormone — melatonin.
- Thyroid and parathyroid glands: topography, structure, hormones — thyroxine, triiodothyronine, thyrocytonin, parathyroid hormone.
- The thymus gland: topography, structure, age-related changes, function, hormones.
- Pancreas: topography, structure, hormones — insulin, glucagon.
- Adrenal glands: topography, structure, hormones:
  - medulla — adrenaline, norepinephrine;
  - cortex:
    - zona glomerulosa — mineralocorticoids (aldosterone);
    - zona fasciculata — glucocorticoids (hydrocortisone, corticosterone);
    - reticular zone — sex hormones (androgens, estrogen, progesterone).
- Sex glands: structure, topography, hormones:
  - ovarian — estrogens (estradiol, estrone, estriol); progesterone;
  - testicles — androgens (testosterone, androsterone, dehydroandosterone).
- Paraganglia:
  - interrenal system;
  - chromaffin system.

• The concept of APUD — the system, examples of localization of groups of apudocytes and their hormones.

METHODOLOGICAL RECOMMENDATIONS FOR STUDYING THE MATERIAL

Activity	Step Description
Read the introduction to the topic and self-study goals	—
Study the corresponding section in literature sources	Find and demonstrate the corresponding organ on the table / model
Revise the studied material	When revising orally, check the following: 1) English and Latin name of an organ or its part; 2) its functional role; 3) consistent description of the details of the structure; 4) relationship between divisions, layers, parts; 5) hormones and their role in the body
Write down new Latin terms	Write the terms in your notebook
Check your knowledge with self-control questions	Answer the questions given in the assignment

QUESTIONS FOR SELF-CONTROL

1. Name the organs of the integumentary system.
2. Describe the special features of the epidermis.
3. Describe the structures of the dermis.
4. Identify functions of the skin.
5. What is the composition of hair?
6. Describe the physiological role of hair.
7. What do nails consist of?
8. Describe the functions of the nails.
9. Name the two types of sweat glands in the dermis.
10. What is the function of sebaceous glands?
11. Identify three specific kinds of tactile receptors in the dermis.
12. What determines the color of the skin?
13. What is the hypodermis?
14. What are the arrector pili?
15. What is the function of the arrector pili muscle?

16. What is the primary function of the mammary gland?

17. Describe the structure of the mammary gland.

18. Describe the vascularization and the lymphatic drainage of the mammary gland.

19. Give the definition of the endocrine system.

20. What is the function of the endocrine system?

21. Give the definition of the hormones.

22. What is the specific structure of the endocrine glands?

23. Give the definition of an endocrine gland.

24. Classify the hormones.

25. Describe the properties of the hormones.

26. Describe the components of the endocrine system.

27. Describe the principles of the organization of the endocrine system.

28. Classify the endocrine glands according to the origin.

29. Describe the components and location of the hypothalamus. What is the hypothalamo-hypophysial system?

30. Describe the structure of the hypophysis. What is the size of the hypophysis?

31. Describe the relations between the hypothalamus and hypophysis? What hormones of the hypothalamus affect the hypophysis and how do they do it?

32. Name the hormones of the adenohypophysis and of the neurohypophysis.

33. Describe the effects of STH. Describe the symptoms of the insufficiency and excess of STH. Why can the pathology of the STH production occur?

34. Describe the effects of TSH, ACSH, GSH (in males and females).

35. Describe the effects of the hormones of the neurohypophysis (ADH and oxytocine).

36. Describe the location of the epiphysis. What is the size of the epiphysis? What hormones does it produce? What are their functions?

37. Describe the location and structure of the thymus. What age changes occur with the thymus? What hormone and BAS does the thymus produce? Describe the function of the thymus.

38. Describe the location, external structure and normal sizes of the thyroid gland. Describe the internal structure of the thyroid gland.

39. Which hormones does the thyroid gland produce? Describe their effects.

40. Describe the symptoms of the disorder of the thyroid gland hormone production in children and in adults.

41. Describe the location and normal size of the parathyroid glands. Describe their structure. What hormone do the parathyroid glands produce?

42. Describe their function and the symptoms of their pathology.

43. Describe the structure of the endocrine part of the pancreas. What hormones are produced by the cells of the endocrine part of the pancreas?

44. Describe the symptoms of the insufficient and excessive production of insulin.

45. Describe the location and size of the suprarenal glands. Describe their internal structure.

46. Which hormones are produced by the cortex of the suprarenal glands and by the medulla? Describe their effects.

47. Describe the symptoms of the suprarenal gland pathology.

48. Describe the location of the reproductive glands in males and females. What hormones do they produce?

49. Describe the effects of the reproductive hormones. Describe the symptoms of the insufficient production of these hormones.

50. What is the APUD system?

Written task:
Fill in the table

Endocrine gland	Hormone	Hormone function	Hyperfunction	Hypofunction

PRACTICAL SKILLS

1. Testis, *testis*; яичко.
2. Pancreas, *pancreas*; поджелудочная железа.
3. Thyroid gland, *glandula thyroidea*; щитовидная железа.
4. Ovary, *ovarium*; яичник.
5. Suprarenal gland, *glandula suprarenalis*; надпочечник.
6. Mammary gland, *glandula mammaria*; молочная железа.
7. Pituitary gland, *hypophysis*; гипофиз.
8. Epiphysis, *epiphysis*; эпифиз.
9. Hypothalamus, *hypothalamus*; гипоталамус.
10. Thymus, *thymus*; вилочковая железа.

Literature

1. *Human* anatomy : 2 vol. / M. Prives, N. Lysenkov, V. Bushkovich. — Moscow : Mir Publishers, 1985. — Vol. 2. — 439 p., ill.

2. *Textbook* of Human Anatomy. In 3 vol. Vol. 3. Nervous system. Esthesiology / L. L. Kolesnikov, D. B. Nikitiuk, S. V. Klochkova, I. G. Stelnikova. — Moscow : GEOTAR-Media, 2018. — 216 p.

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4. *Gray's* Atlas of Anatomy / L. Richard, A. Drake, W. Vogl, A. W. M. Mitchell et al. — 2nd International edition. — Philadelphia : Elsevier, 2015. — 626 p., ill.

5. *Lecture* material.

THE EXAM QUESTIONS FOR “HUMAN ANATOMY”

Section I: Osteology. Arthrology

1. Bone as an organ. Chemical composition and microscopic structure of the bone. Classification of bones. Terms: diaphysis, epiphysis, metaphysis, and apophysis. Age features of the bone.

2. The vertebrae. Typical structure, differences in the structure of the cervical, thoracic, lumbar vertebrae, sacrum.

3. The connections between vertebrae, between spine and skull: name, structure, classification, ligaments, the muscles that produce movements of the spine.

4. The thorax as a whole: structure, shape, muscles, producing rib movements, blood supply and innervation.

5. Development of the skull in ontogenesis and phylogenesis, individual, age and gender characteristics of the skull, developmental anomalies.

6. Cranial bones. The frontal bone. The occipital bone. The parietal bone.

7. Cranial bones. The sphenoid bone. The ethmoid bone.

8. The nasal cavity: walls, communications, nasal passages. The sinuses of the nasal cavity.

9. The temporal bone. The canals of the temporal bone.

10. The bones of the facial skull. The upper jaw, vomer, lacrimal, nasal and zygomatic bones.

11. The bones of the facial skull. The mandible, palatine and hyoid bone.

12. The vault of the skull, the temporomandibular joint. The temporal and infratemporal fossa. The pterygopalatine fossa, its communications.

13. The external base of the skull. The internal base of the skull. The anterior, middle and posterior cranial fossa.

14. The orbit: walls, openings, communications.

15. The shoulder girdle. The scapula and clavicle. The sternoclavicular joint, acromioclavicular joint, own ligaments of the scapula. Muscles acting on the joints, their vascularization and innervation.

16. The humerus. The shoulder joint. Muscles acting on the joint, their vascularization and innervation.

17. The ulna and the radius. The elbow joint. The muscles acting on it, their vascularization and innervation.

18. The bones of the hand. The joints of hand: characteristic, muscles acting on it, blood supply and innervation.

19. The pelvic bone. The pelvis as a whole. Sex-related differences, the sizes of the female pelvis.

20. The femur. The hip joint, the muscles acting on it, their vascularization and innervation.

21. The tibia, fibula. The knee joint, the muscles acting on it, their vascularization and innervation.

22. Bones of the foot. The ankle joint: characteristic, muscles acting on it, their blood supply and innervation.

23. General characteristics of the bone articulations. Classification of diarthroses by shape, number of articular surfaces, number of axes of movements. Examples.

Section II: Myology

24. The muscles and fascia of the thorax. Structure, functions, vascularization and innervation.

25. The diaphragm, its parts, topography, weak points, blood supply and innervation.

26. Anatomy of the abdominal muscles: muscle groups, their functions, blood supply and innervation.

27. Sheath of the rectus abdominis muscle. White line of the abdomen. Weak points of the front and back walls of the abdomen, diaphragm, pelvis.

28. The inguinal canal: walls, openings, contents. Inguinal hernias.

29. The neck muscles: muscle groups by origin and topography, functions, vascularization and innervation.

30. Regions, triangles of the neck. The cervical fasciae, interfascial spaces.

31. The muscles of facial expression: features, groups, function, blood supply and innervation.

32. The muscles of mastication: attachment, biomechanics of the temporomandibular joint, blood supply and innervation. Fasciae of the head.

33. The muscles of the shoulder girdle: groups, functions, blood supply and innervation, the topography of the shoulder girdle.

34. The upper arm muscles: muscle groups, functions, fasciae, topography, blood supply and innervation.

35. The muscles of the forearm. Structure, function, vascularization and innervation.

36. The muscles of the hand: muscle groups, functions, fasciae, topography, blood supply and innervation. Osteofibrous channels and synovial sheaths of the hand.

37. The muscles of the pelvis. Structure, function, vascularization and innervation.

38. The muscles of the thigh, muscle groups, functions, fasciae, topography, blood supply and innervation.

39. Muscular and vascular lacunae. Their walls, contents. Thigh topography.

40. The muscles and fascia of the leg: topography, blood supply, innervation.

41. The muscles and fascia of the foot. Structure, function, vascularization and innervation.

42. Superficial and deep muscles of the back and occipital region. The fascia of back. Blood supply and innervation of the muscles of the back and occipital region.

Section III: Splanchnology

43. The oral cavity: the structure of the lips, vestibule and proper oral cavity, hard and soft palate, their blood supply and innervation.

44. Milk and permanent teeth, their structure, teeth formula, blood supply and innervation of teeth.

45. The tongue: structure, function, its blood supply, innervation, regional lymph nodes.

46. The salivary glands, position, external structure, excretory ducts, blood supply and innervation.

47. The pharynx: parts, walls, muscles, blood supply and innervation. The regional lymph nodes. The lymphoepithelial ring.

48. The esophagus, its structure, constrictions, blood supply and innervation, the regional lymph nodes.

49. The stomach: structure, relation to the peritoneum, blood supply, innervation, the regional lymph nodes.

50. The small intestine, its divisions, relation to the peritoneum, blood supply, innervation, the regional lymph nodes.

51. The large intestine, its divisions, relation to the peritoneum, blood supply and innervation, the regional lymph nodes.

52. The liver, its structure, topography. The gallbladder. Excretory ducts of bile. Blood supply and innervation, regional lymph nodes.

53. The pancreas: structure, topography, functions. The endocrine part. Innervation, blood supply.

54. Topography of the peritoneum. The relation of the peritoneum to the internal organs. The folds and fossa of the peritoneum on the inner surface of the anterior abdominal wall. The greater and lesser omentum. Topography of the upper storey of the peritoneal cavity. Peritoneal bursae.

55. Topography of the middle and lower storey of the peritoneal cavity.

56. The external nose. The nasal cavity (olfactory and respiratory areas), paranasal sinuses, blood supply and innervation.

57. The larynx: structure, function, topography, divisions. The cartilage of the larynx, ligaments and muscles of the larynx. The mechanism of the voice production.

58. The trachea and bronchi. Topography, structure wall. The structure of the bronchial tree. Blood supply and innervation, the regional lymph nodes.

59. The lungs: structure, function, topography, vascularization, innervation. The pulmonary acinus. The structure of the alveolar tree.

60. The pleura and pleural cavity. The parietal and visceral pleura. The pleural sinuses, their clinical significance. The topography of the pleura.

61. Mediastinum: topography, divisions, organs, blood supply, innervation and lymph nodes.

62. The kidneys, external and internal structure, blood supply and innervation, the regional lymph nodes.

63. The ureters, urinary bladder. Their structure, topography, blood supply and innervation. Constrictions of the ureter.

64. The male urethra: openings, parts, structure, topography, functions, sphincters, constrictions. Innervation and blood supply.

65. The testes, epididymis: external and internal structure. Blood supply and innervation. Pathway for spermatozoids.

66. The spermatic cord: the divisions, process of lowering the testicles. The coats of the testis.

67. The prostate gland, seminal vesicles, bulbourethral glands, their structure, relation to the urethra. Blood supply, innervation. Lymph drainage from the prostate gland.

68. The male external genital organs: their structure, blood supply and innervation, regional lymph nodes.

69. The ovary, its structure, function, topography, development, relation to the peritoneum. The concept of ovarian-menstrual cycle.

70. The uterus: its structure, function, development, abnormalities. The relation of the uterus to the peritoneum. Ligaments of the uterus.

71. The uterine tube: its structure, divisions, relation to the peritoneum. Blood supply, innervation, the regional lymph nodes.

72. The vagina, its function, the structure of the wall. The external female genitals, blood supply and innervation.

73. The perineum: divisions, muscles of the urogenital diaphragm and pelvic diaphragm. The fasciae of the perineum.

Section VI: Central nervous system

74. The spinal cord: external and internal structure, topography, reflex arch, blood supplying.

75. The grey and white matter of the cerebral hemispheres: basal nuclei, capsules. The lateral ventricles: walls, communication.

76. The cerebral cortex: grooves and gyri of the superolateral surface.

77. The frontal and occipital lobes: borders, grooves, gyri, centers.

78. The temporal and parietal lobes of the brain: borders, grooves, gyri, centers.

79. The medial and basal surfaces of the cerebral hemispheres: sulci and gyri. The rhinencephalon.

80. The white matter of CNS: three groups of the white matter fibers. Anatomy of the corpus callosum; fornix.

81. The diencephalon: parts, the structures, functions. Third ventricle: walls, communications.

82. The mesencephalon: external structure, white and grey matter and its function; the cavity of the mesencephalon.

83. The hindbrain: parts, external structure, nuclei of the pons and medulla oblongata.

84. The cerebellum: parts, external structure; cerebellar nuclei and peduncles; the composition of the peduncles.

85. The ascending conduction tracts.

86. The descending conduction tracts.

87. The spinal and cerebral meninges. Intermeningeal spaces.

88. Fourth ventricle: walls, communications. The rhomboid fossa and the projection of nuclei of cranial nerves onto the rhomboid fossa.

Section V: Peripheral nervous system. The autonomic nervous system. Sensory organs

89. The I, II, cranial nerves: names, branches, the regions of innervation. Visual and olfactory pathways.

90. VIII cranial nerve: nuclei, branches, the regions of innervation. Auditory and vestibular pathways.

91. III, IV and VI pairs of cranial nerves –names, nuclei, branches, the regions of innervation.

92. V pair of cranial nerves — nuclei, branches, the regions of innervation.

93. VII pair of cranial nerves — nuclei, branches, the regions of innervation.

94. X pair of cranial nerves — nuclei, branches, the regions of innervation.

95. IX, XI, XII cranial nerves: names, nuclei, branches, topography, regions of innervation.

96. The concept of spinal nerve: its formation, composition of fibers, branches. The anterior branches of thoracic nerves — intercostal nerves.

97. The brachial plexus: formation, topography, long branches, the regions of the innervation.

98. The brachial plexus: formation, topography, short branches, the regions of the innervation.

99. The cervical plexus: formation, topography, branches, area of innervations.

100. The lumbar plexus: formation, topography, branches, area of innervation

101. The sacrococcygeal plexus: formation, topography, branches, area of innervations.

102. The parasympathetic part of autonomic nervous system: general characteristic, centers, ganglia, nerves.

103. The sympathetic part of autonomic nervous system: general characteristic, centers, ganglia, nerves and plexuses.

104. The organs of hearing and balance: general structure. The external ear, middle ear, inner ear: parts, structure, blood supply and innervation.

105. The organ of vision: the eyeball. Its coats, nucleus, chambers. The accessory apparatus of the eyeball. Innervation and blood supply.

106. The thyroid and parathyroid glands: structure, topography, hormones, blood supply, innervation.

107. The hypophysis (pituitary gland): structure, topography, hormones, functions.

108. The suprarenal glands: structure, topography, hormones, blood supply, innervation.

Section VI: Cardiovascular system

109. The heart: external structure, wall structure, soft skeleton of the heart, heart chambers, features of atrial and ventricular myocardium.

110. The heart blood supply: the coronary arteries. Venous drainage of the heart. Innervation of the heart: sympathetic (afferent, efferent), parasympathetic (afferent, efferent), interaction with the cardiac conduction system.

111. The heart: skeletotopy of the heart, points of the valve auscultation, X-ray image of the heart.

112. The heart: wall structure, pericardium, pericardial cavity, blood supply and innervation of the pericardium.

113. The aorta: its parts, the topography and branches of the aortic arch and thoracic aorta.

114. The external carotid artery: its formation, topography, groups of branches, branches, areas of blood supplying, anastomoses.

115. The internal carotid artery: its formation, topography, branches, areas of the blood supplying.

116. The subclavian artery: topography, branches, areas of the blood supplying. Willis circle.

117. The abdominal aorta: its topography, parietal and visceral (paired and unpaired) branches. Anastomoses of the abdominal aorta branches.

118. The common, external, internal iliac arteries, their origin and branches. Topography.

119. The axillary artery: formation, topography, branches, areas of the blood supplying, anastomoses of its branches.

120. The brachial artery: formation, topography, branches, areas of the blood supplying, anastomoses of its branches.

121. The arteries of the forearm: formation, topography, branches, regions of blood supply. The blood supply to the elbow joint.

122. The palmar and dorsal carpal networks: formation, branches. The arteries of the palm: arches, their formation, branches, topography. The blood supply to the thumb and index finger.

123. The femoral artery: its formation, topography, branches and regions which they supply with blood. The blood supply to the hip joint.

124. The popliteal artery: its formation, topography, branches. The blood supply to the knee joint. The popliteal fossa borderlines.

125. The arteries of the leg: its formation, topography, branches and regions of blood supplying. Formation of the malleolar arterial networks.

126. The arteries of the foot: topography, branches and regions which they supply with blood. The arterial arches of the foot.

127. The superior vena cava: its formation, main tributaries. Azygos and hemiazygos veins, their anastomoses.

128. The inferior vena cava: its formation, topography. The tributaries of the inferior vena cava and their anastomoses.

129. The portal vein: its formation, topography. The anastomoses of the portal vein. The circulatory system of the liver.

130. The main lymph collectors of the body: trunks, ducts, the regions from which they take lymph. The lymph nodes. The regional lymphatic nodes of the head, neck, mammary gland.

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Chernomortseva Elena

ANATOMY: VEGETATIVE NERVOUS SYSTEM. SENSORY ORGANS. ENDOCRINE SYSTEM

Methodological recommendations for students of medicine

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