

Semmelweis University
Department of Anatomy, Histology and Embryology

Faculty of Medicine
2nd year 1st semester

ANATOMY HANDBOOK



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Anatomy, Histology and Embryology for EM students

TEACHING DEPARTMENT:

SEMMELWEIS UNIVERSITY

Department of Anatomy, Histology and Embryology

Budapest, Tűzoltó utca 58.

H-1094 Budapest

<http://semmelweis.hu/anatomia>

LEARNING OBJECTIVES

Aims of the lectures in anatomy: Presentation of the important and/or complicated chapters such as introductory chapters, thorax, pelvis, hand, foot, skull, heart, chapters of the visceral organs, central nervous system, **organs of special senses, topographical anatomy.**

Aims of the lectures in cell biology and histology: Presentation of the cell, basic principles in cell biology (mitosis, cytoskeleton, cellular motility), detailed presentation of the basic tissues (epithelial, connective, muscle and nervous). Completing the gross anatomy with the detailed presentation of the fine structure of the organs, including the ultrastructural details as well as the molecular arrangement. Important chapters: basic tissues, viscera, central nervous system.

Aims of the lectures in embryology: Presentation of the early development from the differentiation of the germ cells to the formation of the human embryo (general embryology). Presentation of the development of the organs and functional systems parallel with the gross anatomical and histological lectures including the frequently occurring malformations.

Aims of the practical sessions in the dissecting room: Based on the weekly programs the students study the preparations (bones, joints, muscles, viscera, brain) and dissect (parts of or an entire cadaver). They are aided by the lab instructors. Bones, joints, muscles and peripheral nervous system will be taught primarily in the dissecting room.

Aims of the practical sessions in the histology room: Facilitate the understanding of the basic tissues (epithelial, connective, muscle and nervous) and the fine structure of the organs through the observation and interpretation of histological specimens.

Discussion of the more complicated chapters of the embryology is presented on small group discussions connected to the practical sessions in the dissecting room.

The knowledge of the students will be checked by mid-term tests.

Lectures: first semester: 3x 45 min; second semester: 3x 45 min; third semester: 3x 45 min; fourth semester: 1x 45 min.

Topics of the lectures:

First semester: Gross anatomy of the bones, joints and muscles, basic cytology, basic histology, basic embryology, development of the skull, spine and limbs.

Second semester: Heart and vessels, lymphatic organs, viscera and body cavities; integrated gross anatomy, cytology, histology and embryology.

Third semester: Central and peripheral nervous system, organs of special senses, endocrine organs; integrated gross anatomy, cytology, histology and embryology.

Fourth semester: Topographical anatomy of the head, neck and body cavities (thorax, abdomen, pelvis), cross sectional anatomy.

Practical course

: 6x 45 min; second semester: 6x 45 min; third semester: 4x 45 min; fourth semester: 2x 45 min;

First semester: Gross anatomy of the bones, joints and muscles, basic cytology, basic histology, basic embryology, development of the skull, spine and limbs.

Second semester: Heart and vessels, lymphatic organs, viscera, topography of body cavities; integrated gross anatomy, cytology, histology and embryology. Topographical anatomy of the ventral regions of limbs and the trunk.

Third semester: Central and peripheral nervous system, organs of special senses, endocrine organs; integrated gross anatomy, cytology, histology and embryology. Topographical anatomy of the dorsal regions of limbs and the trunk, including spinal cord.

Fourth semester: Topographical anatomy of the head, neck and body cavities (thorax, abdomen, pelvis), cross sectional anatomy. Review of the subjects taught and studied during the four semesters.

Type of exams: first semester: semifinal; second semester: semifinal; third semester: semifinal; fourth semester: final exam from the subjects of the four semesters..

ECTS credits: four semesters together: 28 (first semester: 9; second semester: 9; third semester: 7; fourth semester: 3)

EM II ANNOUNCEMENTS

Evaluation is made using a five-grade scale (1-5).

Signing of the lecture book: active participation in lectures, dissection room and histology lab sessions is obligatory. Students should attend at least 75% of the scheduled hours to gain a signature proving the validity of the semester. Absences are therefore limited in **25%**.

Midterm examinations: During the four semesters, both practical and theoretical knowledge will regularly be evaluated. The anatomy and histology mid-terms may be oral or written exams. The **anatomy** mid-terms include both identification of several structures on the specimen and theoretical questions related to the subject. The **histology** midterms include the identification of a certain number of structures in slides, as well as, theoretical questions related to the subject. (N.B. there are no histology midterms in the 3rd and 4th semesters.) The results of all tests will appear on the personal achievement cards.

Semifinal examinations: Practical examination - exemption: Every student passing both dissection room midterms will be exempted from a semifinal practical examination. The dissection mark, calculated from the midterm marks (2.0 - 2.49: **2**; 2.5 - 3.49: **3**; 3.5 - 4.49: 4 and 4.5 - 5: **5**), will be written on the personal achievement cards. Midterm failures cannot be retaken. Students, unhappy with their dissection mark, may apply in writing for a practical examination, before the end of the 13th study week, with the Course Director. These students will start their semifinal examination in the dissection room prior to the theoretical part. ***(NB: when opting for a semifinal practical examination, you will lose the exemption and also may fail the examination during the practical part)***

Theoretical examination is then composed of oral theoretical questions and the identification/description of one histological specimen.

Obligatory dissection work – every student is required to produce a fully dissected specimen during the 2nd, 3rd (or, if earlier prevented, the 4th) semester to be exempted from the dissection part of the final examination. The specimen will be evaluated by a departmental jury generally in the end of the 3rd semester.

Notebooks should be regularly used in **histology lab sessions** in order to prepare schematic drawings of the histological specimens. Students will be asked to present their histology notebooks, containing the drawings, during the semifinal or final exams.

*N.B. – In case, neither the first nor the repeated takes of a semifinal exam have been successful and so the exam has to be postponed to the following, exam period (i.e. 'CV' exam), only those students will be allowed to go for a CV exam, parallel to continuing their studies **whose average score of the midterm tests) is equal, or higher than 2.00.***

RULES AND REGULATIONS IN THE DISSECTING ROOM

IT IS STRICTLY FORBIDDEN to eat, drink, smoke, to chew gums, or to use music devices or phones.

Bags and coats should be left in the lockers before entering the dissecting room.

The lockers will have to be locked using your padlocks.

Please, remember to keep your valuables always on you, or lock them in the lockers since the department takes no responsibility for lost items.

Everybody is supposed to behave in the dissecting room conforming to the spirit of the site. Loud speech, out-of-place jokes and any kind of behaviour, disregarding the dignity of human corpses, should strictly be avoided.

Students are expected to be prepared for the practical work.

Students should take care of the furniture and equipment of the dissecting room. Do not sit on the dissection tables or stand on the tripod stools to avoid accidents. **Fire and work safety regulations** should be maintained. The dissection room is a hazard area. **Cleanliness and order** should be kept.

Working in the dissection room involves the use of **sharp and pointed tools**, injuries should be reported to the lab instructor. The technical personnel will provide first aid when necessary.

The white lab coats should be worn while in the dissection room, but should be removed before leaving the dissection room area. The purpose of wearing the lab coats is to protect one's clothing from contacting the cadaver specimen. Furthermore we advise you to wear closed toed shoes and clothing covering the legs. In the end of the class, lab coats should be emptied and left in order on the coat hangers. The department is not responsible for valuables left in the dissecting room.

Only the members of the study group can participate in the sessions, visitors may be present only with prior permission by the lab instructor. Students can leave the sessions only with the approval of the lab instructor.

Photos or videos can only be made with the agreement and in the presence of the lab instructor, but not of cadaver specimens.

Specimen preparations should be wrapped and labeled. Dissection materials of other groups or individuals should not be handled. Dissected cadaver pieces should be discarded in a designated container and discarded blades have to be collected separately.

Dissecting rooms are closed between 6:00 PM to 8:00 AM and over the weekends Students may not stay in the dissecting room without the supervision of one of the assistants of the department. In the absence of an instructor, the technical personnel should ask the students to leave the dissecting room.

**SMOKING IS STRICTLY FORBIDDEN
ON THE DEPARTMENTAL PREMISES,
INCLUDING THE GARDEN AND THE YARD!**

EM II.

Subject matter of the 3rd semester

I. Central nervous system

- a) gross anatomy of brain and spinal cord, meninges
- b) nuclei and tracts of brain and spinal cord
- c) development of the brain and the spinal cord

II. Peripheral nervous system

- a) cranial nerves
- b) spinal nerves
- c) autonomic nervous system
- d) development of the peripheral nervous system

III. Organs of special senses (gross anatomy, histology and embryology)

- a) organ of vision, visual pathways
- b) organ of hearing and equilibrium, auditory pathways, vestibular system
- c) organ of olfaction, olfactory pathways
- d) organ of taste, gustatory pathways
- e) skin and appendages

IV. Endocrine organs (gross anatomy, histology and embryology)

V. Topographical anatomy of the limbs

Midterm test I. Topic: Gross anatomy and embryology of the central nervous system.
Date: 4th week

Midterm test II. Topic: Microscopy of the central nervous system. Cranial nerve nuclei (written)
Date: 8th week

Midterm test III. Topic: Topographical anatomy of the dorsal regions, intracranial topography, spinal nerves
Date: 12th week

Semifinal examination

Topics: Subject matter of the semester

Practical examination:

Calculated from the 1st and 3rd midterm examinations (see in the Announcements)

Oral theoretical examination:

Gross anatomy, histology and embryology of the central and peripheral nervous systems together with the organs of special senses and the endocrine glands.

Academic Year 2015/2016 First Semester EM II. Groups 1- 8

Week	Lecture <i>Tue 13.15.-14.00 and Thu 11.00-12.40</i>	Dissection room	Histology lab
Week 1 Sept 7-11.	1. Introduction to the study of the nervous system Meninges, hemispheres, the lateral ventricles 2. Gross anatomy of the diencephalon, the III. ventricle 3. Gross anatomy of the brainstem and the cerebellum The IV. ventricle	Divisions of the brain, meninges, arteries and veins of the brain, surface structures of the hemispheres, basis cerebri. Specimen demonstration: dura mater, sinuses	
Week 2 Sept 14 - 18.	4. Blood supply to the brain, CSF circulation 5. <i>Differentiation of the neural tube, development of the spinal cord. Neural crest</i> 6. <i>Differentiation of the brain vesicles</i>	Lateral ventricles, third ventricle Brain stem, fourth ventricle, cerebellum	
Week 3 Sept 21 - 25.	7. Gross anatomy of the spinal cord, spinal segment Dermatomes 8. Neuronal architecture of the spinal cord: proprioceptive and nociceptive (withdrawal) reflex arcs. 9. Neuronal architecture of the spinal cord: autonomic reflex arc. Spinal pathways	Cross sections of the brain. Specimen demonstration: spinal cord together with the membranes	Nervous system I. Peripheral nerve, motor end plate, spinal cord, brainstem
Week 4 Sept 28- Oct 2.	10. Introduction to cranial nerves. Classification of sensory, motor and autonomic nuclei 11. Microscopy of the brainstem: tracts and nuclei of the medulla oblongata 12. Microscopy of the brainstem: tracts and nuclei of the pons and midbrain. Reflex arc of mastication	Fine structure of spinal cord. Revision Test I: Anatomy and development of the brain and the spinal cord	
Week 5 Oct 5-9.	13. Microscopy of the diencephalon 14. Cells of the CNS: neurones (axon, dendrite, synapses) 15. Cells of the CNS: glia cells	Dissection of the dorsal regions Skull, intracranial space Microscopy of the CNS	
Week 6 Oct 12 - 16.	16. Microscopy of the cerebral cortex 17. Sensory systems 18. Microscopy of the cerebellum, pathways	Dissection of the dorsal regions Spinal cord Microscopy of the CNS	
Week 7 Oct 19 - 23.	19. Structure and connections of the basal ganglia. Motor pathways 20. Trigeminal nerve, ophthalmic and maxillary divisions 21. – National holiday	Dissection of the dorsal regions <i>Thursday: no class for grs. 14 and 16.</i> <i>Friday: no class for grs. 1-6, 12-16</i>	Nervous system II. Cerebellar and cerebral cortices Pineal body
Week 8 Oct 26 - 30.	22. Trigeminal nerve, mandibular divisions. Facial nerve 23. Glossopharyngeal, vagus, accessory and hypoglossal nerves 24. The hypothalamo-hypophysial system. The pituitary gland	Dissection of the dorsal regions Microscopy of the CNS Test II: Microscopy of the central nervous system, cranial nerve nuclei	
Week 9 Nov 2 – 6.	25. Endocrine organs: pineal body, thyroid, parathyroid, adrenal glands 26. Skin and appendages. Mammary gland 27. Patient demonstration	Dissection of dorsal regions Demonstration of head and neck regions.	Endocrine organs Pituitary, thyroid, parathyroid, suprarenal glands, Endocrine cells in the testicle, ovary, corpus luteum and pancreas
Week 10 Nov 9 - 13.	28. Fibrous and vascular coats of the eyeball 29. Lens, chambers of the eye, vitreous body, accommodation 30. Inner coat of the eyeball, retina	Dissection of dorsal regions.	
Week 11 Nov 16 - 20.	31. Optic nerve, visual pathway, visual cortex 32. Extraocular muscles and eye movements 33. Protective and lacrimal apparatus of the eye. Development of the eye	Dissection of dorsal regions.	Organs of special senses I. Eyeball, retina, lacrimal gland
Week 12 Nov. 23 - 27.	34. External ear, auditory tube, tympanic cavity, tympanic membrane, auditory ossicles 35. Bony and membranous labyrinth 36. Spiral organ of Corti. Development of the auditory and vestibular system	Test III: Topographical anatomy of the dorsal regions, spinal and cranial nerves Organs of special senses Dissection of the eye	
Week 13 Nov 30 - Dec 4.	37. Auditory pathway, auditory cortex 38. Vestibular system 39. Olfactory and gustatory systems	Organs of special senses	
Week 14 Dec 9 - 13.	40. Limbic system 41. Parasympathetic and sympathetic nervous systems 42. Chemical neuroanatomy, introduction to neuroscience	Organs of special senses	Organs of special senses II. Organ of Corti, palm skin, scalp skin, mammary gland

Academic Year 2015/2016 First Semester EM II. Groups 9- 16

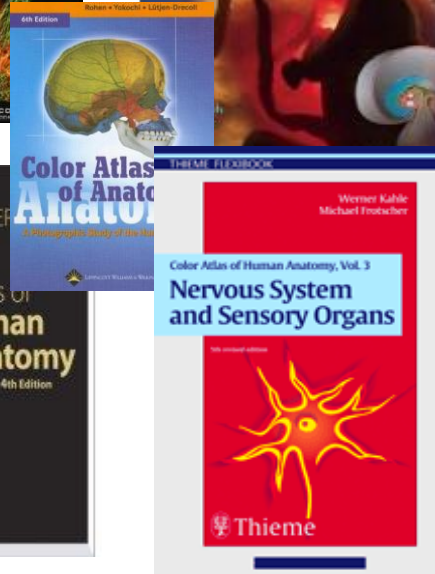
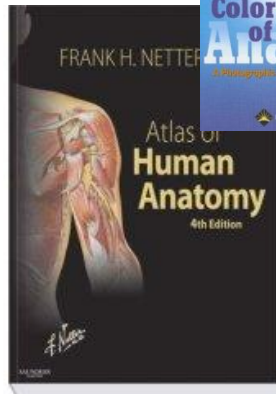
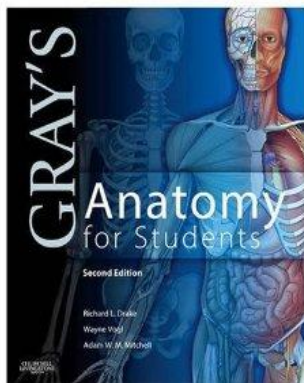
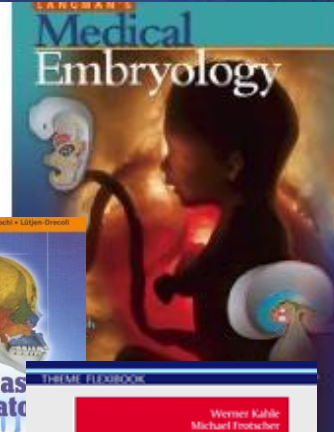
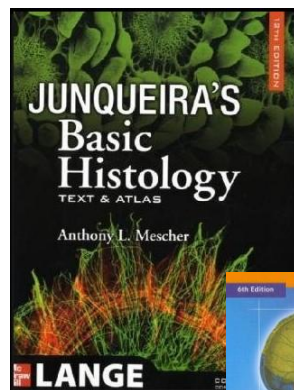
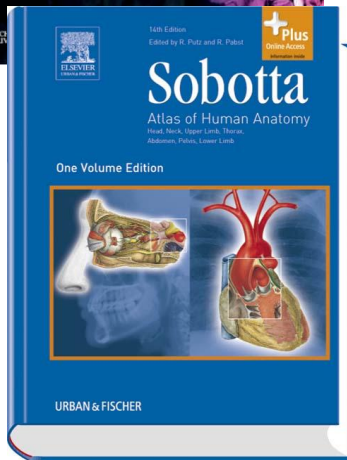
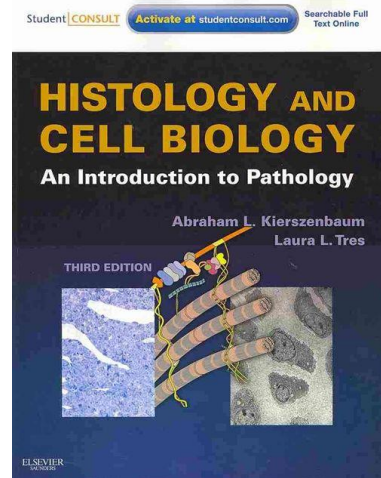
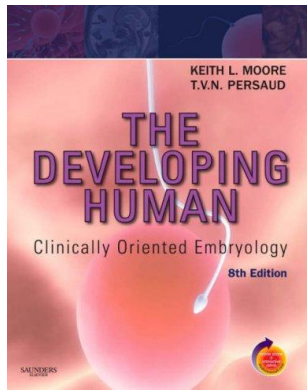
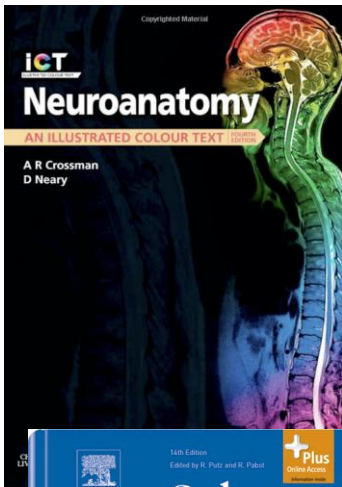
Week	Lecture <i>Mon 12.10-13.50 and Wed 11.20-12.05</i>	Dissection room	Histology lab
Week 1 Sept 7-11.	<ol style="list-style-type: none"> 1. Introduction to the study of the nervous system 2. Meninges, hemispheres, the lateral ventricles 3. Gross anatomy of the diencephalon, the III. ventricle 3. Gross anatomy of the brainstem and the cerebellum 4. The IV. ventricle 	Divisions of the brain, meninges, arteries and veins of the brain, surface structures of the hemispheres, basis cerebri. Specimen demonstration: dura mater, sinuses	
Week 2 Sept 14 - 18.	<ol style="list-style-type: none"> 4. Blood supply to the brain, CSF circulation 5. <i>Differentiation of the neural tube, development of the spinal cord. Neural crest</i> 6. <i>Differentiation of the brain vesicles</i> 	Lateral ventricles, third ventricle Brain stem, fourth ventricle, cerebellum	
Week 3 Sept 21 - 25.	<ol style="list-style-type: none"> 7. Gross anatomy of the spinal cord, spinal segment 8. Dermatomes 8. Neuronal architecture of the spinal cord: proprioceptive and nociceptive (withdrawal) reflex arcs. 9. Neuronal architecture of the spinal cord: autonomic reflex arc. Spinal pathways 	Cross sections of the brain. Specimen demonstration: spinal cord together with the membranes	Nervous system I. Peripheral nerve, motor end plate, spinal cord, brainstem
Week 4 Sept 28- Oct 2.	<ol style="list-style-type: none"> 10. Introduction to cranial nerves. Classification of sensory, motor and autonomic nuclei 11. Microscopy of the brainstem: tracts and nuclei of the medulla oblongata 12. Microscopy of the brainstem: tracts and nuclei of the pons and midbrain. Reflex arc of mastication 	Fine structure of spinal cord. Revision Test I: Anatomy and development of the brain and the spinal cord	
Week 5 Oct 5-9.	<ol style="list-style-type: none"> 13. Microscopy of the diencephalon 14. Cells of the CNS: neurones (axon, dendrite, synapses) 15. Cells of the CNS: glia cells 	Dissection of the dorsal regions Skull, intracranial space Microscopy of the CNS	
Week 6 Oct 12 - 16.	<ol style="list-style-type: none"> 16. Microscopy of the cerebral cortex 17. Sensory systems 18. Microscopy of the cerebellum, pathways 	Dissection of the dorsal regions Spinal cord Microscopy of the CNS	
Week 7 Oct 19 - 23.	<ol style="list-style-type: none"> 19. Structure and connections of the basal ganglia. Motor pathways 20. Trigeminal nerve, ophthalmic and maxillary divisions 21. Trigeminal nerve, mandibular division 	Dissection of the dorsal regions <i>Thursday: no class for grs. 14 and 16.</i> <i>Friday: no class for grs. 1-6, 12-16</i>	Nervous system II. Cerebellar and cerebral cortices Pineal body
Week 8 Oct 26 - 30.	<ol style="list-style-type: none"> 22. Facial and glossopharyngeal nerves 23. Vagus, accessory and hypoglossal nerves 24. The hypothalamo-hypophysial system. The pituitary gland 	Dissection of the dorsal regions Microscopy of the CNS Test II: Microscopy of the central nervous system, cranial nerve nuclei	
Week 9 Nov 2 – 6.	<ol style="list-style-type: none"> 25. Endocrine organs: pineal body, thyroid, parathyroid, adrenal glands 26. Skin and appendages. Mammary gland 27. Patient demonstration 	Dissection of dorsal regions Demonstration of head and neck regions.	Endocrine organs Pituitary, thyroid, parathyroid, suprarenal glands, Endocrine cells in the testicle, ovary, corpus luteum and pancreas
Week 10 Nov 9 - 13.	<ol style="list-style-type: none"> 28. Fibrous and vascular coats of the eyeball 29. Lens, chambers of the eye, vitreous body, accommodation 30. Inner coat of the eyeball, retina 	Dissection of dorsal regions.	
Week 11 Nov 16 - 20.	<ol style="list-style-type: none"> 31. Optic nerve, visual pathway, visual cortex 32. Extraocular muscles and eye movements 33. Protective and lacrimal apparatus of the eye. Development of the eye 	Dissection of dorsal regions.	Organs of special senses I. Eyeball, retina, lacrimal gland
Week 12 Nov. 23 - 27.	<ol style="list-style-type: none"> 34. External ear, auditory tube, tympanic cavity, tympanic membrane, auditory ossicles 35. Bony and membranous labyrinth 36. Spiral organ of Corti. Development of the auditory and vestibular system 	Test III: Topographical anatomy of the dorsal regions, spinal and cranial nerves Organs of special senses Dissection of the eye	
Week 13 Nov 30 - Dec 4.	<ol style="list-style-type: none"> 37. Auditory pathway, auditory cortex 38. Vestibular system 39. Olfactory and gustatory systems 	Organs of special senses	
Week 14 Dec 9 - 13.	<ol style="list-style-type: none"> 40. Limbic system 41. Parasympathetic and sympathetic nervous systems 42. Chemical neuroanatomy, introduction to neuroscience 	Organs of special senses	Organs of special senses II. Organ of Corti, palm skin, scalp skin, mammary gland

Histology specimens
Faculty of Medicine, Second year, First semester
2015/2016.

EM II

<i>Week</i>	
Week 3 Sept 21 - 25.	<p><u>Nervous system I.</u></p> <p>Revision: 36. Peripheral nerve, cross section (HE) Demonstration: Peripheral nerve (osmium tetroxide)</p> <p>43. Motor end plate (AchE) 37. Spinal ganglion (HE) 38. Autonomic ganglion (AgNO₃) 39. Spinal cord (multipolar neurons Nissl) 99. Midbrain (Luxol-Nissl) 100. Medulla oblongata (Luxol-Nissl)</p>
Week 7 Oct 19 - 23.	<p><u>Nervous system II.</u></p> <p>40. Cerebral cortex (pyramidal neurones, Bielschowsky) 42. Cerebral cortex (pyramidal neurones, Golgi) 94. Hippocampus (HE) 95. Cerebellar cortex(HE) 41. Cerebellum (GFAP immunocytochemistry) 90. Pineal body(HE)</p>
Week 9 Nov 2 - 6.	<p><u>Endocrine system</u></p> <p>86. Hypophysis (HE) 87. Hypophysis (chrome haematoxyline floxin) 88. Thyroide gland (HE) 89. Parathyroide gland (HE) 92. Suprarenal gland (HE) Demonstration: 74. Leydig cells (testicles, HE) 78. Ovarian follicles, interstitial glands (ovary, HE) 79. Corpus luteum (HE) 70. Islets of Langerhans (pancreas, HE)</p>
Week 11 Nov 16 - 20.	<p><u>Organs of special senses I.</u></p> <p>96. Bulbus oculi (HE) 97. Retina (semithin section, toluidine blue) 9. Pigment cells (retina, unstained) 33. Lacrimal gland (HE)</p>
Week 14 Dec 9 - 13.	<p><u>Organs of special senses II. and skin</u></p> <p>98. Cochlea (semithin section, toluidine blue) 6. Palm skin (HE) 11. Scalp skin (HE) 17. Scalp skin (Azan) 18. Scalp skin (Hornowsky) 85. Mamma non lactans (HE) 93. Mamma lactans (HE)</p>

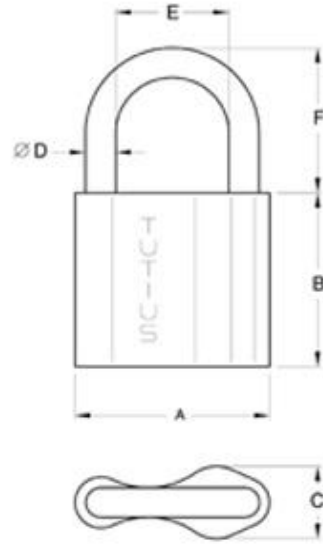
RECOMMENDED BOOKS



During dissection classes keep your belongings in the lockers and lock them with your padlock!

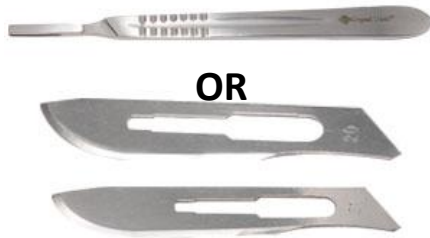
PADLOCK SIZE: 6 mm

Please, remember to keep your valuables always on you, or lock them in the lockers since the department takes no responsibility for lost items.



DISSECTION ROOM TOOL

SCALPEL



OR



A PAIR OF ANATOMICAL FORCEPS

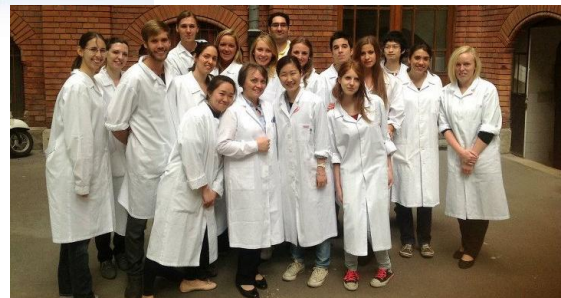


RUBBER GLOVES



PROTECTIVE CLOTHING (LABCOAT)

GOGGLES



TOPICS OF THE SEMIFINAL EXAM

EM II.

Third semester

Practical exam

A dissection mark will be calculated from the results of the two successfully passed dissection midterms. On the day of the semifinal examination, students may sit for a practical exam in case they would like to go for a higher dissection mark. (Prerequisite: written application before the end of week 13)

Histology exam (office)

Description of a histological specimen **with the help of a microscope**

Microscopical structure of the central and peripheral nervous systems, different staining techniques (cerebral and cerebellar cortices, neurons, supporting cells, ganglia, receptors and effectors, synapses)

Endocrine organs

Gross and microscopical anatomy of the pituitary gland; development of the posterior lobe
Blood supply, histology and development of the anterior and intermediate lobes of the pituitary gland

Gross and microscopical anatomy of the pineal gland

Gross and microscopical anatomy and the development of the thyroid gland

Gross and microscopical anatomy and the development of the parathyroid gland

Gross and microscopical anatomy and the development of the suprarenal gland

Histology of the Langerhans islets

Endocrine cells and function of the male and female gonads

Microscopical structure of the eyeball

Histology of the lacrimal gland

Microscopical structure of the cochlea

Microscopical structure of the skin (scalp and palm)

Histology of the mammary gland (lactating and non-lactating)

Theory questions (office)

Microscopical structure and development of the central nervous system

Development and primary differentiation of the neural tube

Development of the spinal cord; neurohistogenesis

Differentiation of the prosencephalon vesicle; development of the hemispheres and the lateral ventricle

Differentiation of the diencephalon vesicle, development of the third ventricle

Differentiation of the mesencephalon and rhombencephalon vesicles, development of the fourth ventricle

Roots, branches and components of the spinal nerves; spinal segment

Fine structure (microscopy) of the spinal cord

Neurons and function of the spinal proprioceptive (stretch) reflex
Neurons and function of the spinal flexion (withdrawal) reflex
Neurons and functions of the visceral reflexes
Microscopical anatomy of the medulla
Microscopical anatomy of the pons
Microscopical anatomy of the midbrain
Nuclei of the cranial nerves
Microscopical anatomy of the cerebellum
Afferent and efferent cerebellar connections
Microscopical anatomy of thalamus, divisions, connections and transmitters
Hypothalamus, hypothalamo-hypophyseal systems
Microscopical anatomy of the basal ganglia, divisions, connections and transmitters
Histology of the cerebral cortex; cortical fields
Internal capsule, divisions
Tracts of the protopathic sensibility (anterolateral system)
Tracts of the epicritic sensibility (posterior funiculus/medial lemniscus)
Corticospinal tract (pyramidal tract)
Extrapyramidal system
Limbic system (nuclei and tracts)

Gross anatomy and development of the peripheral nervous system

Development, fate and differentiation of the cells in the neural crest
Development of the peripheral nervous system
Nuclei and branches of the IIIrd, IVth and VIth cranial nerves
Nuclei of the trigeminal nerve; course and fiber composition of the branches of the ophthalmic (V/1) nerve
Course and fiber composition of the branches of the maxillary nerve (V/2)
Course and fiber composition of the branches of the mandibular nerve (V/3)
Nuclei, course and fiber composition of the branches of the facial nerve (VII)
Nuclei, course and fiber composition of the branches of the glossopharyngeal nerve (IX)
Nuclei, course and fiber composition of the branches of the vagus nerve (X)
Nuclei, course and fiber composition of the branches of the accessory (XI) and hypoglossal nerves (XII)
Cervical plexus and its branches
Brachial plexus and its short branches to the neck and shoulder girdle
Lumbar plexus and its branches
Sacral plexus and its branches
General organization of the autonomic nervous system
The sympathetic trunk
Cranial part of the parasympathetic nervous system

Gross anatomy, histology and embryology of the organs of special senses

Gross anatomy and microscopic structure of the fibrous coat of the eye ball (cornea, sclera)
Gross anatomy and microscopic structure of the vascular coat of the eye ball (choroid, ciliary body, iris)
Gross anatomy, microscopic structure and development of the nervous coat of the eye ball (retina)

Neurons of the visual pathways; localization and microscopic structure of the visual cortex
Gross anatomy, microscopic structure and development of the lens, accommodation
Gross anatomy and content of the chambers of the eye, circulation of the aqueous humor; gross anatomy of the vitreous body
Gross anatomy and function of the external ocular muscles.
Visual reflexes
Gross anatomy, microscopic structure of the eye lids; conjunctiva, Tenon's capsule and periorbit
Gross anatomy, microscopic structure and development of the lacrimal apparatus
Gross anatomy and development of the external ear and the tympanic membrane
Gross anatomy and development of the tympanic cavity and the auditory tube
Gross anatomy and development of the auditory ossicles; joints, muscles, and the mucous membrane of the tympanic cavity
Sensory innervation and blood supply of the tympanic cavity
Gross anatomy of the bony labyrinth
Gross anatomy and development of the labyrinth
Morphology, development and divisions of the vestibular apparatus
Receptors and neuronal connections of the vestibular system
Gross anatomy, microscopic structure and development of the cochlear duct and the organ of Corti
Neurons of the auditory pathways
Internal acoustic meatus
Organ and pathways of olfaction
Organ and pathways of taste

