

Semmelweis University
Department of Anatomy, Histology and Embryology

Faculty of Dentistry
1st year

ANATOMY HANDBOOK
September 2018



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Anatomy, Histology and Embryology for ED 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 important and/or complicated topics such as: 1st semester - the structure of the body wall (e.g. thorax, pelvis), extremities and the cranium, 2nd semester - the morphology of internal organs including the cardiovascular, digestive and urogenital systems; 3rd semester - the composition of the central nervous system, together with the organs of special senses and topography of body regions, and the 4th semester is devoted entirely to maxillofacial topographical anatomy.

Aims of the lectures in Histology - Presentation of the cell, basic principles in cellular morphology, detailed description of the epithelial, connective, muscle and nervous tissues. During the 3 semesters, the lectures contribute to the gross anatomical description of organs with a detailed presentation of their fine structures, including ultrastructural details. 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 (basic embryology) as well as the development of the locomotor system (1st semester). In the 2nd and 3rd semesters, the embryology topics will complement the gross anatomy and histology lectures of the organs and systems, also mentioning the most frequent malformations.

For the deeper understanding of relatively difficult questions small group discussions may be organized during the practical dissection room classes.

Aims of the practical dissection classes - In the first three semesters, based on their weekly programs, the students will study the morphology of the human body using anatomical specimens (bones, joints, muscles, viscera, brain) as well as learning the basic principles of dissection, including the proper usage of tools (scalpel, forceps, scissors) under the supervision of their lab instructors. The anatomy of the locomotor system and the peripheral nervous system will be principally taught in the dissecting room.

Aims of the histology practical classes - Under supervision by the lab instructor, the students will learn the use of the light microscope and the individual viewing of histology slides will facilitate the understanding of the basic tissues (epithelial, connective, muscle and nervous) and the fine structure of the organs.

The knowledge of students will be tested by regular **mid-term examinations** and a Semester-end Dissection Test.

Lectures:

First semester: 3x 45 min; second semester: 3x 45 min;

third semester: 3x 45 min; fourth semester: 3x 45 min.

Topics:

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

Second semester: Morphology, histology and embryology of the heart and vessels, lymphatic organs, viscera, body cavities and serous membranes. Sectional anatomy of the thorax, abdomen and pelvis. Description of the diaphragmas.

Third semester: Morphology, histology and embryology of the central and peripheral nervous systems, the organs of special senses, as well as of the endocrine organs; topographical anatomy of the extremities.

Fourth semester: Maxillofacial anatomy - organs, cavities, nervous and vascular supply of the head and neck regions, including topographical and cross sectional anatomy. Revision of the topics of the first three semesters.

Practical course:

First semester 5x 45 min; second semester: 4x 45 min;

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

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

Second semester: Morphology, histology and embryology of the heart and vessels, lymphatic organs, viscera, body cavities and serous membranes. Sectional anatomy of the thorax, abdomen and pelvis. Description of the diaphragmas

Third semester: Morphology, histology and embryology of the central and peripheral nervous systems, the organs of special senses, as well as of the endocrine organs; topographical anatomy of the extremities.

Fourth semester: Topographical anatomy of the head and neck. Individual revision of the subjects taught and studied during the four semesters.

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

ECTS credits: four semesters together: 29 (first semester: 8; second semester: 8; third semester: 7; fourth semester: 6)

ED I ANNOUNCEMENTS

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

Semester acceptance (i.e. signature): 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 semester, both practical and theoretical knowledge will regularly be evaluated. The midterm tests are obligatory and cannot be done at a different time, neither can they be retaken. The anatomy and histology mid-terms may be oral or written exams. **Anatomy** mid-terms include both identification of several structures on the specimen and theoretical questions related to the subject. **Histology** midterms include the identification of a certain number of structures in slides, as well as theoretical questions related to general embryology. The results of all tests will appear on the personal achievement cards. Absence will be recorded as 0 (zero) and calculated accordingly in the average of midterm tests.

A semester practical mark is calculated from the midterm marks together with the personal achievement mark given by the group instructor. This practical mark will be counted into the semifinal examination and will be written on the personal achievement cards.

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

Semifinal examinations are composed of the following parts:

1. written pretest,
2. oral examination composed of practical and theoretical questions in Macroscopy and Histology i.e., identification and full description of the morphological features of the relevant body parts and; identification/description of two histological specimens. Please note, that relevant theoretical/embryological questions may also arise during the practical examination parts.

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

*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 **joint course registration**, 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, to chew a gum, or to use music devices / phones.

Bags and coats should ALWAYS be left in the lockers PRIOR TO entering the dissecting room.

The lockers will have to be locked using your OWN padlocks.

Please, remember to keep your valuables always on you, or lock them in the lockers.

The department takes no responsibility for lost items.

Students are expected to be prepared for the practical work.

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 should take care of the 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 strictly 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 of the black board drawings can only be made with the agreement of the lab instructor.

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 (with the exception of special workdays appearing in the schedule). 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 ED I.

Subject matter of the 1st Semester

I. Anatomy:

1. Locomotor system:
 - a) bones, including the skull (osteology)
 - b) joints (arthrology)
 - c) skeletal muscles (myology)
2. Vessels of the upper and lower limbs
 - a) branches of the brachial artery and tributaries of the brachial vein
 - b) branches of the femoral artery and tributaries of the femoral vein
3. Large nerves of the limbs.

II. Basic tissues (epithelia, connective and supporting tissues, skeletal, smooth and cardiac muscle types, elements of the peripheral nervous system)

III. Human development (embryology):

1. From germ cells to the formation of the embryo, placenta and fetal membranes
2. Development of the musculoskeletal system (head, trunk, limbs, muscles)

Test I.

Topics: Bones of the skeleton

Date: 6th week, October 16.

Test II.

Topics: Epithelial-, connective- and supporting tissues

Date: 10th week, November 13.

Test III.

Topics: Joints, muscles, vessels and nerves of the extremities.

Date: 12th week, November 27.

Group test

Topic: Embryology

Date: 14th week (TBA)

Semifinal examination

Topic: Subject matter of the semester

1) **Written 'e-learning type' pretest**

2) **Histology** of basic tissues (1 digital slide).

General embryology

3) **Practical examination and theoretical questions** (oral examination)

Gross anatomy and development of the musculoskeletal system and the skull.

Academic Year 2018/2019 Faculty of Dentistry, 1st Semester

Week	LECTURE <i>Tuesdays 13.40-14.25 Fridays 8.00-9.40</i>	DISSECTION <i>Tuesdays 8.00– 9.30 / 14.40-16.10 Wednesdays 15.40-16.25</i>	HISTOLOGY <i>Tuesdays 11.45-13.15</i>
Week 1 Sept 10-14	1. The role of anatomy, histology and embryology in the medical curriculum. Terminology. 2. Concept and types of tissues, epithelial tissue, simple epithelia 3. General osteology.	Dissection room activity, tools safety and rules. Osteology	Introduction to histology. Rules, use of the microscope. Histological stains. Study of a compact and a hollow organs
Week 2. Sept 17-21	4. Skull. Sphenoid and ethmoid bones 5. Temporal bone 6. Stratified epithelia	Osteology	Simple epithelia
Week 3. Sept 24-28	7. Neurocranium, including the calvary, internal and external skull bases 8. Viscerocranium, including the orbit 9. Glandular epithelium	Osteology	Stratified epithelia
Week 4. Oct 1-5	10. Mandible and maxilla 11. Nasal cavity, paranasal sinuses 12. Connective tissue fibres, types of the connective tissue	Osteology	Glandular epithelia
Week 5. Oct 8-12	13. Bony oral cavity, pterygopalatine and infratemporal fossae 14. General arthrology and general myology 15. Connective tissue cells, blood cells	Osteology	Connective tissue I. Fibrous elements, ground substance
Week 6. Oct 15-19	16. Shoulder girdle, shoulder joint and the muscles acting upon it 17. Elbow joint and the muscles acting upon it 18. Bones, joints and muscles of the hand	1. 1st midterm test: Osteology 2. Dissection of the extremities (joints, muscles, vessels, nerves)	Connective tissue II. Cellular elements Blood, bone marrow
Week 7. Oct 22-26 <i>October 22-23 are holidays</i>	19. - October 23. is a national holiday 20. Supporting tissue (cartilage, bone) 21. Pelvic girdle. Hip joint and the muscles acting upon it.	October 23. is a national holiday Dissection of the extremities (joints, muscles, vessels, nerves)	October 23. is a national holiday
Week 8. Oct 29 – Nov 2 <i>November 1-2 are holidays</i>	22. Bone formation, bone remodelling November 1-2 are national holidays	Dissection of the extremities (joints, muscles, vessels, nerves)	Supporting tissues : Cartilage, Bone
Week 9. Nov 5-10 <i>November 10 Saturday is a workday (Friday schedule)</i>	23. Knee joint and the muscles acting upon it muscles of the foot 24. Bones, joints and 25. <i>Introduction to human embryology. Gametogenesis, fertilization. Cleavage</i> 26. <i>Blastulation, implantation.</i> 27. <i>The bilaminar embryo. Formation of ectoderm and endoderm.</i>	Dissection of the extremities (joints, muscles, vessels, nerves) Dissection of the extremities	Types of ossification <i>and</i> Revision
Week 10. Nov 12-16	28. <i>Formation and differentiation of mesoderm. Derivatives of the germinal layers.</i> 29. <i>Neurulation. Folding of the embryo</i> 30. Muscle tissue: skeletal, smooth and cardiac muscles	Dissection of the extremities (joints, muscles, vessels, nerves)	2nd midterm test: Epithelial, connective and supporting tissues
Week 11. Nov 19-23	31. <i>Fetal membranes, umbilical cord. Structure of the placenta, placental circulation.</i> 32. <i>Formation of vessels, fetal circulation, twinning, developmental malformations</i> 33. Nervous tissue: neurons and supporting cells	Dissection of the extremities (joints, muscles, vessels, nerves)	Smooth, skeletal and cardiac muscle tissues
Week 12. Nov 26-30	34. Muscles of facial expression 35. Temporomandibular joint, muscles of mastication 36. Nervous tissue: fibres, synapses, receptors, effectors	1. 3rd midterm test: Joints, muscles, vessels and nerves of the extremities 2. Muscles of the head and neck (prosections)	Peripheral nervous system. Spinal and autonomic ganglia, peripheral nerve, motor end plate
Week 13. Dec 3-7	37. Muscles, fasciae and triangles of the neck 38. Thoracic cage, diaphragm 39. Abdominal muscles, rectus sheath, hernia canals	Muscles of the head, neck and trunk (prosections)	Placenta. Umbilical cord.

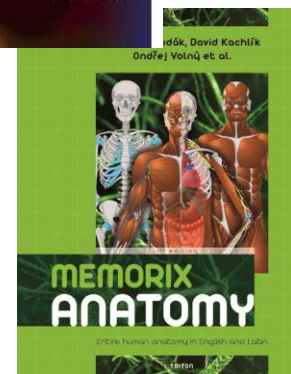
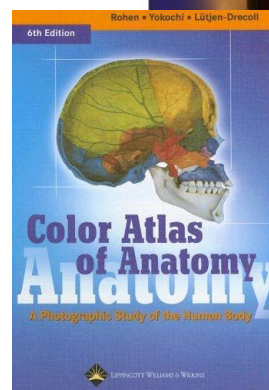
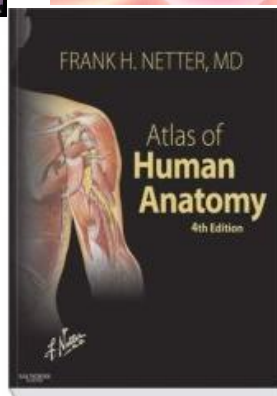
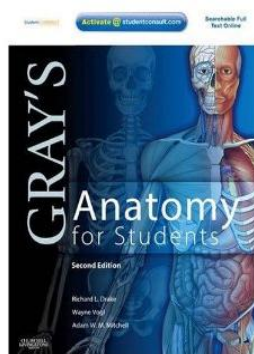
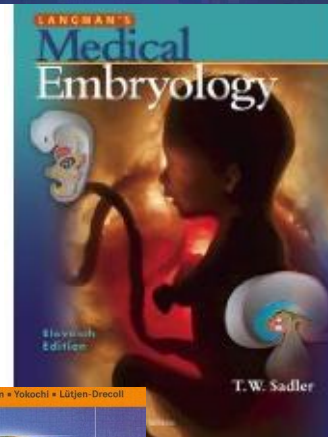
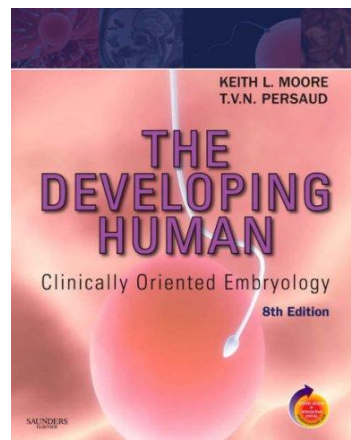
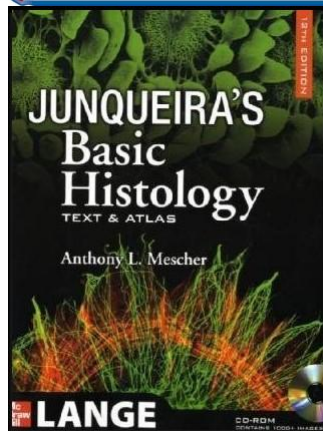
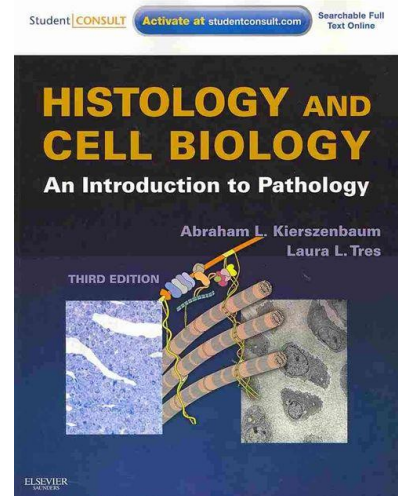
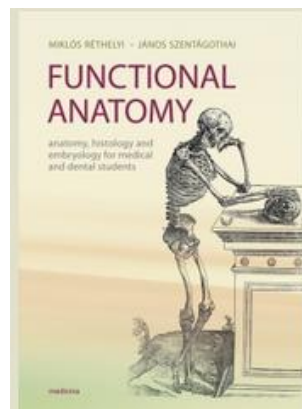
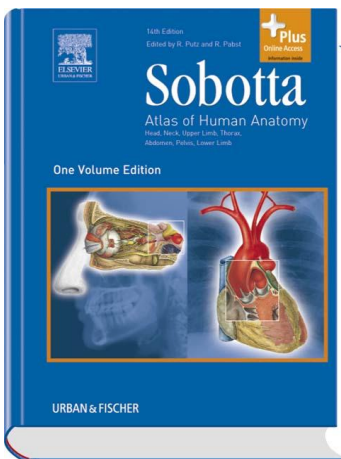
Week 14. Dec 10-14	40. Vertebral column; movements and muscles. Actions and muscles of the atlantooccipital and atlantoaxial joints. 41. <i>Development of the vertebral column and the locomotor system</i> 42. <i>Development of the skull. Fontanelles</i>	Muscles of the head, neck and trunk (prosections) Embryology test	Revision
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Academic Year 2018/2019 Faculty of Dentistry, 1st Semester
Histology specimens

Week	Specimens
Week 1 Sept 10-14	Use of the microscope No. 5. Wall structure of a hollow organ (esophagus, H-E) No. 69. Structure of a parenchymal (compact) organ (liver, H-E)
Week 2. Sep 17-21	No. 50. Simple squamous epithelium (endothel, elastic artery, H-E) No. 19. Simple cuboidal epithelium (umbilical cord, H-E) No. 3. Simple columnar epithelium (g, H-E) No. 4. Pseudostratified epithelium (epididymis, H-E) For demonstration: No. 1. Mesothel (peritoneum, silver impregnation) No. 2. Simple cuboidal epithelium (kidney, HE) No. 72. Pseudostratified epithelium (trachea, H-E)
Week 3. Sept 24-28	No. 5. Stratified squamous nonkeratinized epithelium (esophagus, H-E) No. 6. Stratified squamous keratinized epithelium (palmar skin, H-E) No. 7. Stratified columnar epithelium (penis, H-E) No. 8. Transitional epithelium (urinary bladder, H-E)
Week 4. Oct 1-5	No. 10. Goblet cells (large intestine, H-E) No. 11. Holocrine secretion (sebaceous gland, hairy skin, H-E) No. 12. Apocrine secretion (prostate, H-E) No. 13. Merocrine secretion (submandibular gland, H-E)
Week 5. Oct 8-13 <i>Saturday is a workday (Monday schedule)</i>	No. 14. Collagen fibers (tendon, H-E) No. 15. Elastic fibers (large artery, RF) No. 16. Reticular fibers (liver, silver impregnation) No. 17. Differentiation between epithelial and connective tissues (hairy skin, Azan) No. 18. Collagen and elastic fibres (hairy skin, Hornowsky)
Week 6. Oct 15-19	No. 19. Embryonic connective tissue - mesenchyme (umbilical cord, H-E) No. 20. Connective tissue cells (scar tissue, H-E) No. 21. Mast cells (peritoneum, toluidine blue) No. 22. Fat cells – adipocytes (tongue, Sudan III.) For demonstration: No. 81. Cell rich connective tissue (uterus, H-E) No. 46. Reticular connective tissue (spleen, H-E) Reticular connective tissue (lymph follicle, silver impregnation) No. 6. Fat cells (palmar skin, H-E) No. 52. Blood cells (blood smear – May-Grünwald-Giemsa) For demonstration: Bone marrow cells (bone marrow smear, May-Grünwald-Giemsa)
Week 7. Oct 22-26 <i>October 22-23 are holidays</i>	No Histology class due to the national holidays
Week 8. Oct 29 – Nov 2 <i>November 1-2 are holidays</i>	No. 23. Hyalin cartilage (rib, H-E) No. 24. Elastic cartilage (epiglottis, RF) No. 25. Fibrous cartilage (meniscus, H-E) No. 26. Bone – cross section (Schmorl) No. 27. Bone – longitudinal section (Schmorl)
Week 9. Nov 5-10	No. 28. Endochondral ossification (phalanx, H-E) No. 29. Intramembranous ossification (calvary, H-E)
Week 10. Nov 12-16	MIDTERM TEST (epithelial-, connective- and supportive tissues)
Week 11. Nov 19-23	No. 30. Smooth muscle – cross and longitudinal sections (Jejunum, H-E) No. 31. Skeletal muscle – longitudinal section (H-E) No. 32. Skeletal muscle – cross section (H-E) No. 34. Cardiac muscle - cross section (H-E) No. 35. Cardiac muscle - longitudinal section, Purkinje-fibers (H-E)

Week 12. Nov 26-30	No. 37. Pseudounipolar neurons (spinal ganglion, H-E) No. 38. Multipolar neurons (autonomic ganglion, silver impregnation) No. 36. Peripheral nerve - cross section (H-E) For demonstration: Nerve - cross section (osmium tetroxide impregnation) No. 43. Motor end plate (acetylcholinesterase histochemical reaction)
Week 13. Dec 3-7	No. 19. Umbilical cord (H-E) No. 83. Placenta (H-E)
Week 14. Dec 10-14	Revision

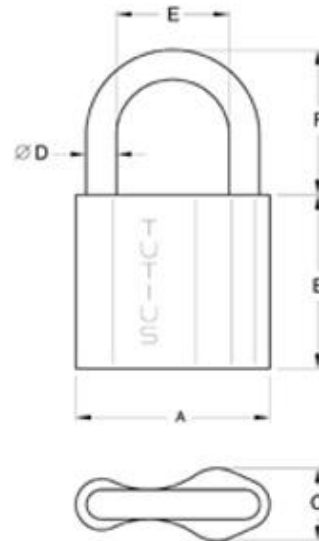
RECOMMENDED BOOKS



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

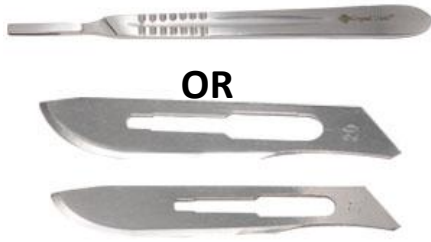
PADLOCK SIZE: 6 mm

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 TOOLS

SCALPEL



OR



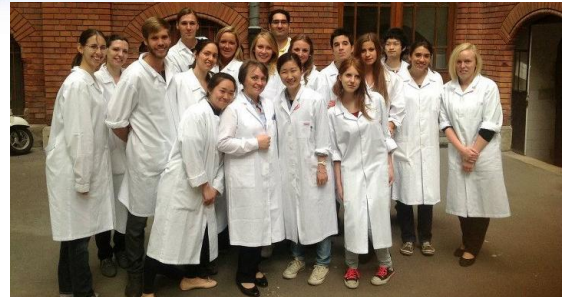
A PAIR OF ANATOMICAL FORCEPS



RUBBER GLOVES



PROTECTIVE CLOTHING (LABCOAT)



GOGGLES



ED I.

Semester-end and examination announcements

During the last week of the semester all our students will be informed of their **practical mark** and whether they have gained a **signature** for the present semester. The **signature** will be written in neptun on a preselected day.

All three midterm marks, together with the calculated practical exam mark (if applies) will be written on the personal achievement card. The practical exam mark will be counted in the result of the semifinal examination.

Semifinal examinations will be held preferably on Tuesdays, Wednesdays and Thursdays during the 7 weeks of the examination period, **starting at 13.00**

N.B. The last changes concerning **registration/deregistration** from a date maybe done via the NEPTUN system **48 hours prior** to the selected day.

Parts of the semifinal examination

- 1) **Written pretest** including, Anatomy and Histology
- 2) **Histology of basic tissues** + relevant theoretical background (slides ,oral).
- 3) **Identification of anatomical structures** + relevant theoretical background (prosections, oral)

Please, leave your belonging in a locker (histology floor) and gather in front of the **HISTOLOGY LAB** (or TBA) at least 15 minutes before the examination starts. Please, remember to have your

- ID card
- histology note book
- pair of forceps on you.

In case of an unsuccessful examination, the 1st retake will be free of charge, while for a **second (or third) repeated exam** you will need to pay a fee ahead of the retake examination and present a proof of it upon entering the examination room.

*In case neither the first, nor the repeated, takes of a semifinal exam have been successful, the exam may be postponed to the following exam period (as a 'CV' exam) together with registering for ana2regular course in case the **average score of the midterm tests is equal, or higher than 3.00.***

TOPICS OF THE SEMIFINAL EXAM

ED I.

Topics (topics of the 1st and 3rd MIDTERM examinations)

Skull

- Anterior cranial fossa (composition, boundaries, connections)
- Middle cranial fossa (composition, boundaries, connections)
- Posterior cranial fossa (composition, boundaries, connections)
- Walls and connections of the orbit
- Walls and connections of the nasal cavity
- Inferior surface and connections of the base of the skull
- Bony walls of the oral cavity, the temporal and infratemporal fossa
- Walls and connections of the pterygopalatine fossa

Joints of the extremities

Muscles, vessels and nerves of the extremities (without the cutaneous innervation)

HISTOLOGY

Description of a histological specimen with the help of a microscope

Further questions related to the inspected slide

Concept of basic tissues	Differentiation of granulocytes, lymphocytes and monocytes
Definition and classification of epithelial tissue	Histology of cartilage
Simple epithelia	Histology of the osteoid tissue
Stratified epithelia	Intramembranous ossification
Membrane specializations of epithelia	Endochondral ossification
Glandular epithelia	Growth and remodeling of bone
Cells of connective tissue	Smooth muscle and myoepithelial cells
Ground substance and fibres of connective tissue	Skeletal muscle tissue
Types of connective tissue	Cardiac muscle tissue
Umbilical cord and placenta	Histology of the peripheral nervous system (sensory and autonomic ganglia)
Blood and the formed elements of blood	Supporting cells in the peripheral nervous system
Histology of the bone marrow, maturation of erythrocytes and platelets	Nerve fibers, myelin sheath
	Motor end-plate

LOCOMOTOR SYSTEM 1 - description of a joint (surfaces, capsule, ligaments, type, axes, movements) and the muscles acting upon the joint

Fibrous and cartilaginous joints
Components of the synovial joints
Classification of synovial joints; movements and mechanisms
Structure of the vertebral column, the gross anatomy of the muscles acting upon it
Movements and muscles of the head (atlantooccipital and atlantoaxial joints)
Joints of the shoulder girdle, the gross anatomy of the muscles acting upon them
The shoulder joint, the gross anatomy of the muscles acting upon it
The elbow joint, the gross anatomy of the muscles acting upon it
Structure and movements of the wrist (radiocarpal) joint,
the gross anatomy of the muscles acting upon it
Metacarpophalangeal and interphalangeal joints, the gross anatomy of the muscles concerned with the movements
Carpometacarpal, metacarpophalangeal and interphalangeal joints of the thumb,
the gross anatomy of the muscles concerned with the movements
The hip joint and the gross anatomy of the muscles concerned with the movements
The knee joint and the gross anatomy of the muscles concerned with the movements
The ankle joint together with the gross anatomy of the muscles acting upon it
The subtalar and talocalcaneonavicular joints, the muscles acting upon them
The temporomandibular joint and the gross anatomy of the muscles acting on it

MUSCULOSKELETAL SYSTEM - a topic unrelated to joints

Architecture and classification of bones
Bones and spaces of the skull, including the description of the individual bones (see above at the ***Practical examination*** part)
Structure and actions of somatic muscles
Osteofibrous structure of the thoracic cage (bones, joints, ligaments, movements)
Muscles and movements of the thorax
Muscles of the back and nape (occipital region)
The axilla, the quadrangular and triangular spaces
The cubital fossa
Muscles and cross section of the arm
Muscles and cross section of the forearm
Osteofibrous spaces and muscle compartments of the hand, tendinous sheaths
Composition of the pelvis (bones, ligaments and membranes)
Muscles of the buttock, the posterior abdominal wall and the pelvis (external and internal muscles of the hip)
Osteofibrous compartments, muscles and cross section of the thigh
Popliteal fossa
Subinguinal hiatus, vascular and muscular compartments; adductor canal
Osteofibrous compartments, muscles and the cross section of the leg
Structure of the foot, arches of the foot
Osteofibrous compartments of the foot, tendinous sheaths
Muscles of mastication
Diaphragm
Lateral abdominal muscles and fasciae
Rectus abdominis muscle and the rectus sheath
Inguinal canal
Femoral canal
Superficial muscles of the neck and the muscle triangles
Deep muscles of the neck and the laminae of the cervical fascia
Muscles of facial expression

EMBRYOLOGY

Spermatogenesis
Oogenesis
Fertilization, cleavage of the zygote
Blastocyst formation; the bilaminar embryonic disc
Implantation
Formation of the intraembryonic mesoderm; the notochord
Neurulation (neural tube and neural crest)
Differentiation of the intraembryonic mesoderm; formation and derivatives of the somites
Derivatives of the intermediate mesoderm
Lateral plate mesoderm and its derivatives
Folding of the embryo
Development of the primitive cardiovascular system, the fetal circulation
The structure and function of the placenta
Development of the fetal membranes (chorion and amnion) and the umbilical cord

Periods embryonic and fetal life

Twin formation

Development of the limbs

Development of the vertebral column

Development of the skull

Development of the musculoskeletal system