Semmelweis University
Department of Anatomy, Histology and Embryology
2022/2023

Faculty of Medicine
1st year, 2nd semester

HANDBOOK
Macroscopic Anatomy and Embryology II
Microscopic Anatomy and Embryology I

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Macroscopic Anatomy and Embryology I-II.
Microscopic Anatomy and Embryology I-II.

TEACHING DEPARTMENT:

SEMMELWEIS UNIVERSITY
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Budapest, Tűzoltó utca 58.
H-1094 Budapest
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LEARNING OBJECTIVES

Aims of the lectures in Macroscopic Anatomy - Presentation of important and/or complicated topics such as the structure of the body wall (e.g. thorax, pelvis), extremities and the cranium; the morphology of internal organs including the cardiovascular, digestive and urogenital systems; and the composition of the central nervous system, together with the organs of special senses and topography of body regions.

Aims of the lectures in Microscopic Anatomy/Histology - Presentation of the cell, basic principles in cellular morphology, detailed description of the epithelial, connective, muscle and nervous tissues. During the 2 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). The embryology topics complement the gross anatomy and present 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 two 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, scizzors) under the supervision of their lab instructors. Human development is taught together with Macroscopy.

Aims of the histology practical classes - From the second semester of the first year, supervised by their lab instructor, Students will learn the use of the a digital light microscope. 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**.

Lectures: First semester: 1x 45 min (Macroscopic Anatomy and Embryology I); second semester: 2x45 min Macroscopic Anatomy and Embryology II and 1x 45 min Microscopic Anatomy and Embryology I; third semester: 3x 45 min (Microscopic Anatomy II)

Practical classes: First semester: 6x 45 min (Macroscopic Anatomy and Embryology I) ; second semester: 6x 45 min Macroscopic Anatomy II and 4x45 min Microscopic Anatomy and Embryology I; third semester: 2x 45 min Microscopic Anatomy II.

Topics:

First semester: Gross anatomy of the bones, joints and muscles; composition, vessels and nerves of limbs and the body wall, skull, organs, cavities, nervous and vascular supply of the head and neck regions. General Embryology. Development of the skull, spine and limbs.

Second semester: Morphology and Embryology of the heart and vessels, thoracic/abdominal/pelvic viscera, body cavities and serous membranes. Sectional anatomy of the thorax, abdomen and pelvis. Description of the diaphragms. Macroscopy of central and peripheral nervous systems, organs of special senses.

General histology (basic tissues). Histology of the heart and vessels, the lymphatic system, gastrointestinal and urogenital organs.

Third semester: Histology and embryology of the central and peripheral nervous system together with the organs of special senses and endocrine organs. Microscopy of the CNS

EM I Macroscopic Anatomy and Embryology II.
Announcements

ACCEPTENCE OF THE SEMESTER:

Active participation in dissection room sessions is obligatory for every student. Students should attend at least 75% of the scheduled hours, including the midterm tests, to gain a signature proving the validity of the semester. Absences are therefore limited in **25%**. Attendance will be recorded in the dissection room classes.
Midterm absences should be made up for on selected retake dates.

Attendance at practical classes is obligatory

Students should present themselves well prepared and on time to start with the dissection work. Attendance is regularly checked and students will have to sign a presence sheet once the teacher has verified their presence.
Students unfit to start the practical class at the **starting time specified in the time table** will be recorded as „*being late*". According to the *Study policy 28. § 12. point* - 3 (three) such occasions of „*being late*„ will add up to a **recorded absence**.
Furthermore, students arriving later than 5 minutes past the starting time may participate in the class but their presence will not be recorded/accepted (i.e. counts as an absence).

MIDTERM EXAMINATIONS

During the semester, both practical and theoretical knowledge will regularly be evaluated.
Attendance (but not a successful passing of the midterm) is obligatory at the two mid-term tests.
Students absent from the mid-term tests should reattend at a given timepoint or their semester will not be accepted.
The midterms are held in the dissection room, and composed of identification of several structures on the specimen together with theoretical questions related to the subject.

Test I. (oral, obligatory to attend) **Date:** 7th week (3rd class of the week)
Topics: *Internal organs of the head, neck, thorax, abdomen and pelvis, together with their development*
1st retake date: Week 8 (Thursday or Friday), 2nd retake date: Week 13 (Monday or Tuesday)

Test II. (oral, obligatory to attend) **Date**: 13th week (3rd class of the week)
Topics: *Organs of the retroperitoneal and pelvic organs together with their development. Macroscopy of the central nervous system, intracranial topography*
1st and 2nd retake dates: Week 14 (Wednesday, Thursday or Friday)

BONUS MARK - Students may earn a ***bonus dissection mark*** (4 or 5 only) from the average of the two oral tests. A mark 4 (good) can be earned if the midterm average is 4,00 (4+4 or 3+5); while a mark 5 (excellent) will be earned if the average of the midterm marks is at least 4,50 (4+5 or 5+5).
This ***bonus mark*** will be added to the marks of the practical part of the final examination in case it increases the final mark.

*Please note that only **marks from the first, official, attempt are counted in**, marks earned at the retake midterm/s are not considered. Furthermore, the result of the first attempt cannot be improved/upgraded by taking the retake midterm.*

DISSECTION WORK – *during the two semesters, Students are given selected dissection tasks to improve their dexterity as well as to deepen their knowledge concerning topographical relations. Students should submit their task before the end of the the 1st or the 2nd semester to be able to sit for the final examination.*

EXAM COMPETITION (written)

All students with **an average of 4,0 from the two midterms are invited to participate** in a written (moodle) competition from the topics of the 2 semesters of the subject held on Week 13. Students achieving good marks (4 or 5) at the test may be **exempted**** from the written part of the final examination and thus will have to sit only for the oral/dissection part.

2nd round (pin test)

The **first 10 students** achieving the best results in the written test are invited to participate in the 2nd round (a pin test) where certain anatomical structures (labelled by numbers) will have to be identifed on true specimens / prosections. The competition is held during week 14.
The winners of the 1st, 2nd and 3rd prizes will be decorated with a diploma of merit.

FINAL EXAMINATION

Topics: Subject matter of the two semesters (Macroscopic Anatomy I-II.)

The final examination consists of practical and theoretical parts:

1. Written pretest (Macroscopic Anatomy questions, via the moodle system) unless exempted
2. Oral examination (Identification of structures on anatomical prosections, including relevant theoretical/ Embryology questions)

Marking system

The final result/mark of the examination is calculated from the following partial marks:

1. Written test (unless exempted**)
2. Musculoskeletal system
3. Internal organs
4. Macroscopy of the central nervous system

+

5. *Bonus dissection mark* (for those having an average of 4,00-5,00 from the midterm marks)

PLEASE NOTE

1. Only those students are eligible to sit for the final examination who have successfully finished their dissection task.
2. Students enrolled in a CV course in Macroscopic Anatomy I. may only sit for the final examination in Macroscopic Anatomy II. following a successful examination in Macroscopic Anatomy I.

Students may request an oral examination to replace the written theoretical part for the 2nd or 3rd retakes of the semifinal examination. The request will have to be submitted in writing with the Course Director ***48 hours prior to the date of the examination****.* ***This request has to be resubmitted in case students would like to ask for a further occasion.***

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Macroscopic Anatomy and Embryology II. EM 1-12

Week	Lectures *EM 1-12 Mon 11.00-11.45, Wed 14.45-16.25*	EM 1-12 Lecturers	Dissection room classes *EM 1-6 Tue Wed Fri* *EM 7-12 (24) Mon Tue Thurs*
Week 1 02.13 - 02.17.	1 Nasal cavity, paranasal sinuses 2 Oral cavity, tongue, palate, faucial isthmus. Salivary glands 3 Morphology and development of teeth.	1 Székely 2 Kozsurek 3 Shahbazi	Dissection /inspection of the wall and cavities of the head and neck region Dissection /inspection of the cervical internal organs
Week 2 02.20 - 24.	4 Pharynx, esophagus 5 Larynx 6 Development of the face, malformations	4 Vereczki 5 Alpár 6 Nagy	
Week 3 02.27- 03.03.	7 Development of the pharyngeal arches, development of the foregut 8 Thoracic cavity, mediastinum. Chambers of the heart, external features. Structure of heart wall, valves, fibrous skeleton. Pericardium 9 Cardiac vessels and nerves, conducting system. Surface projection. Auscultation points.	7 Nagy 8 Kocsis 9 Kocsis	Opening of the thorax, dissection of the thoracic cavity Opening of the abdominal cavity, dissection /inspection of the abdominal organs
Week 4 03.06 - 10.	10 Development of the heart Development of arteries and veins 11 Morphology of trachea and the lung. Pleura. 12 Development of the respiratory system. Postpartum adaptation of the circulatory system	10 Pálfi 11 Rácz 12 Minkó	
Week 5 03.13 - 03.17. ***03.15. National holiday***	13 Stomach and small intestines (duodenum, jejunum, ileum) ***14 March 15 – National holiday*** ***15 March 15 – National holiday***	13 Ádám 14------ 15------	
Week 6 03.20 -24.	16 Liver, gall bladder, pancreas, spleen 17 Large intestine, rectum Development of the midgut and hindgut 18 Peritoneal relations of abdominal organs. Development of the peritoneum, separation of body cavities	16 Rácz 17 Nagy 18 Dóra	
Week 7 03.27 – 31.	19 Morphology of the kidney, capsules of the kidney, ureter, urinary bladder 20 Morphology and coats of the testicle 21 Morphology of the epididymis, spermatic cord, seminal vesicle and prostate	19 Pálfi 20 Barna 21 Katz	Dissection /inspection of the abdominal organs **<u>Midterm 1</u> Morphology and development of the internal organs of the head&neck, thorax and abdomen.**
Week 8 04.03 - 07. ***Friday is holiday***	22 Morphology of penis and male urethra. Male perineum 23 Ovary, Fallopian tube and uterus 24 Vagina, female perineum, external genital organs	22 Barna 23 Katz 24 Székely	Dissection/ inspection of the retroperitoneal organs and perineum together with organs of the lesser pelvis
Week 9 04.10 - 14. ***Easter Monday is holiday***	25 ***Easter Monday*** 26 Development of the urinary system 27 Development of genital organs	25--------- 26 Nagy 27 Kálmán	
Week 10 04.17- 21.	28 Topographical divisions of the central nervous system, developmental units 29 Meninges, epidural and subarachnoideal spaces, ventricles, choroidal plexus, CSF 30 Lobes of the cerebral cortex, topographical subdivisions, structure and function of the medial, lateral and basal cortical fields	28 Ádám 29 Horváth 30 Kozsurek	Dissection/ inspection of the brain and spinal cord.
Week 11 04.24 -28.	31 Topography and components of the basal ganglia and the diencephalon (thalamus, hypothalamus), the 3rd ventricle. 32 Topography and components of the brainstem (midbrain, pons and medulla oblongata), the 4th ventricle 33 Arterious, venous and lymphatic circulation of the brain	31 Katz 32 Horváth 33 Kálmán	Dissection/ inspection of the brain and spinal cord. Intracranial spaces.
Week 12 05.01 - 05.	34 ***May 1*** 35 The autonomic nervous system. Sympathetic and parasympathetic nervous systems 36 Cranial nerve nuclei.Trigeminal nerve (CN 5)	34--------- 35 Tóth 36 Rácz	
Week 13 05.08 - 12.	37 Facial nerve (CN 7), glossopharyngeal nerve (CN 9), vagus nerve (CN 10) 38 Spinal cord, spinal ganglia, spinal segment. Spinal nerves, nerve plexuses 39 Intracranial topography, orbit ***COMPETITION (1st round - TBA)***	37 Dóra 38 Horváth 39 Adorján	Cranial nerve branches **<u>Midterm 2.</u> Retroperitoneum. Morphology and development of the pelvic organs. Macroscopy of CNS. Intracranial topography**
Week 14 05.15 - 19.	40 Lymphatic system. Regional lymphatic drainage of organs, lymph nodes 41 Topographical relations of the thoracic cavity 42 Topographical relations of the abdominal cavity ***COMPETITION (2nd round - TBA)***	40 Székely 41 Adorján 42 Adorján	Cross sectional anatomy Revision

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Macroscopic Anatomy and Embryology II. EM I 13-24

Week	**Lectures** *EM 13-20 Wed 12.30-13.15, Thurs 10.00-11.40*	**EM 13-24 Lecturers**	**Dissection room classes** *EM 13-17, 23 Tue Wed Fri* *EM 18-22 Mon Thurs Fri*
Week 1 02.13 - 02.17.	1 Nasal cavity, paranasal sinuses 2 Oral cavity, tongue, palate, faucial isthmus 3 Salivary glands	1 Székely 2 Lendvai 3 Kozsurek	Dissection /inspection of the walls and cavities of the head and neck region Dissection /inspection of the cervical internal organs
Week 2 02.20 - 24.	4 Morphology and development of teeth 5 Pharynx, esophagus 6 Larynx	4 Shahbazi 5 Vereczki 6 Alpár	
Week 3 02.27- 03.03.	7 Development of the face, malformations Development of the pharyngeal arches 8 Thoracic cavity, mediastinum. Chambers of the heart, external features. Structure of heart wall, valves, fibrous skeleton. Pericardium 9 Cardiac vessels and nerves, conducting system. Surface projection. Auscultation points.	7 Nagy 8 Székely 9 Székely	Opening of the thorax, dissection of the thoracic cavity Opening of the abdominal cavity, dissection /inspection of the abdominal organs Opening of the abdominal cavity,
Week 4 03.06 - 10.	10 Development of the heart 11 Development of arteries and veins 12 Morphology of trachea and the lung. Pleura.	10 Minkó 11 Zsiros 12 Ádám	
Week 5 03.13 - 03.17. ***03.15. National holiday***	***13 March 15 - National Holiday*** 14 Development of the respiratory system. Postpartum adaptation of the circulatory system 15 Stomach and small intestines (duodenum, jejunum, ileum)	13 -------- 14 Minkó 15 Ádám	
Week 6 03.20 -24.	16 Liver, gall bladder, pancreas, spleen. 17 Large intestine, rectum 18 Development of the foregut, midgut and hindgut	16 Ádám 17 Székely 18 Nagy	
Week 7 03.27 – 31.	19 Peritoneal relations of abdominal organs. Development of the peritoneum, separation of body cavities 20 Morphology of the kidney, capsules of the kidney, ureter, urinary bladder 21 Morphology and coats of the testicle	19 Dóra 20 Ádám 21 Barna	Dissection /inspection of the abdominal organs **<u>Midterm 1</u> Morphoplogy and development of the internal organs of the head&neck, thorax and abdomen.**
Week 8 04.03 - 07. ***Friday is holiday***	22 Morphology of the epididymis, spermatic cord, seminal vesicle and prostate 23 Morphology of penis and male urethra. Male perineum 24 Ovary, Fallopian tube and uterus	22 Katz 23 Barna 24 Katz	Dissection/ inspection of the retroperitoneal organs and perineum together with organs of the lesser pelvis
Week 9 04.10 - 14. ***Easter Monday is holiday***	25 Vagina, female perineum, external genital organs 26 Development of the urinary system 27 Development of genital organs	25 Pálfi 26 Nagy 27 Kálmán	
Week 10 04.17- 21.	28 Topographical divisions of the central nervous system, developmental units 29 Meninges, epidural and subarachnoideal spaces, ventricles, choroidal plexus, CSF 30 Lobes of the cerebral cortex, topographical subdivisions, structure and function of the medial, lateral and basal cortical fields	28 Ádám 29 Horváth 30 Pálfi	Dissection/ inspection of the brain and spinal cord.
Week 11 04.24 -28.	31 Topography and components of the basal ganglia and the diencephalon (thalamus, hypothalamus), the 3rd ventricle. 32 Topography and components of the brainstem (midbrain, pons and medulla oblongata), the 4th ventricle. 33 Arterious, venous and lymphatic circulation of the brain	31 Ádám 32 Horváth 33 Kálmán	Dissection/ inspection of the brain and spinal cord. Intracranial spaces.
Week 12 05.01 - 05.	34 The autonomic nervous system. Sympathetic and parasympathetic nervous systems 35 Cranial nerve nuclei 36 Trigeminal nerve (CN 5), facial nerve (CN 7)	34 Tóth 35 Barna 36 Rácz	
Week 13 05.08 - 12.	37 Glossopharyngeal nerve (CN 9), vagus nerve (CN 10) 38 Spinal cord, spinal ganglia, spinal segment. Spinal nerves, nerve plexuses 39 Intracranial topography, orbit ***COMPETITION (1st round - TBA)***	37 Dóra 38 Horváth 39 Adorján	Cranial nerve branches **<u>Midterm 2.</u> Retroperitoneum. Morphology and development of the pelvic organs. Macroscopy of CNS. Intracranial topography**
Week 14 05.15 - 19.	40 Lymphatic system. Regional lymphatic drainage of organs, lymph nodes 41 Topographical relations of the thoracic cavity 42 Topographical relations of the abdominal cavity ***COMPETITION (2nd round - TBA)***	40 Székely 41 Adorján 42 Pálfi	Cross sectional anatomy Revision

Topics of the final examination in Macroscopic Anatomy and Embryology II

Macroscopic Anatomy and Embryology I
see in the previous Handbook

Internal organs of the head & neck region (morphology and development)
Oral cavity (divisions, boundaries)
Floor of mouth, sulcus lateralis linguae
Macroscopy of the tongue
Types and morphology of teeth, blood supply and innervation
Tooth development
Salivary glands together with topography
Faucial isthmus, palate. Tonsils
Pharynx and parapharyngeal spaces
Blood supply and innervation of pharynx
Pharyngeal muscles
Nose, nasal cavity (boundaries, nasal meatus, vessels)
Paranasal sinuses (connections, vessels)
Larynx (shape, position, muscles, vessels, nerves)
Skeleton and joints of larynx together with the fibroelastic membranes, mucous membrane
Common and external carotid arteries and their branches. Maxillary artery and its branches
Venous drainage of face and neck
Lymph nodes and lymphatic vessels of the head&neck
Development of the face, including the developemnt of the oral and nasal cavities
Development and differentiation of the foregut
Derivatives of the branchial arches
Derivatives of the branchial pouches and grooves
Development of the teeth and tongue

Circulatory system (morphology and development)
Shape, external features of heart
Chambers of heart
Endocardium, ostia, valves of heart
Skeleton of heart, anuli fibrosi
Structure of heart wall
Pulse generating and conducting system of heart
Pericardium
Position and surface projections of heart
Percussion and auscultation (area of cardiac dullness, heart sounds)
Radiology of heart
Early circulation (formation of vessels, basis vascular systems of the embryo/fetus)
Heart development
Pulmonary circulation
Ascending aorta, arch of aorta and its branches
Subclavian artery and its branches
Thoracic aorta and its branches
Abdominal aorta and its branches
Development of arteries (aorta, branchial arterious arches, umbilical arteries)
Celiac trunk and its branches
Superior mesenteric artery and its branches
Inferior mesenteric artery and its branches
External and internal iliac arteries and their branches
Internal pudendal artery and its branches
Superior vena cava and its tributaries
Inferior vena cava and its tributaries
Azygos and hemiazygos veins and their tributaries

Portal vein and its tributaries, portocaval anastomoses
Development of veins (inferior v. cava, portal v., superior v. cava, azygos and hemiazygos veins)
Fetal circulations
Lymphatic drainage of the abdominal and pelvic organs
Thoracic duct, right lymphatic trunk

Morphology and development of the thoracic, abdominal and pelvic organs
Trachea and bronchial tree
Lung (shape, parts, surfaces, hilum)
Lung (position, topography, vessels, nerves)
Surface projection of pleura and lung
Pleura, pleural cavity
Mediastinum (divisions and content)
Development of the lower airways including the lung
Description and topography of the esophagus
Stomach (shape, position, parts, blood supply and innervation). Peritoneal relations
Duodenum (shape, position, divisions, vessels)
Jejunum-ileum (shape, position, vessels)
Large intestine (shape, position, vessels)
Rectum, anal canal (shape, position, vessels)
Liver (shape, position, peritoneal relations, vessels)
Gall bladder and biliary passages (anatomy)
Pancreas (shape, position, vessels)
Peritoneum, greater and lesser omentum, mesentery, omental bursa
Formation and differentiation of the midgut
Formation and differentiation of the hindgut
Development of liver and pancreas
Development of the peritoneum
Formation of body cavities, development of the diaphragm

Kidney (shape, position, hilum, sinus, capsules, vascular architecture)
Renal pelvis and calyces. Ureter
Urinary bladder (shape, position, muscles, vessels)
Female urethra
Male urethra, bulbourethral gland
Development of kidneys
Development of urinary passages
Testis (shape, position, vessels). Scrotum, coats of testis
Epididymis, vas (ductus) deferens, spermatic cord
Seminal vesicle, prostate
Penis (shape, position, mechanism of erection, vessels, nerves)
Pelvic floor, male perineum (connective tissue spaces)
Hernia canals (inguinal and femoral)
Ovary (shape, position, vessels)
Uterine tube (shape, position, vessels)
Uterus (shape, parts, position, supporting structures, vessels) Broad ligament
Vagina, female perineum (connective tissue spaces)
External female genital organs (mons pubis, labia, vestibule of vagina, greater vestibular gland, vessels)
Development of gonads, formation and migration of primordial germ cells
Development of male genital system
Development of female genital system
Development of the external genital organs

Macroscopy of the nervous system
Intracranial topography Dura mater, dural sinuses
Arachnoid mater, pia mater, cisterns, CSF circulation
Description and meninges of the spinal cord
Brain stem (medulla oblongata, pons, midbrain)
Cerebellum
Diencephalon (parts, blood supply). Thalamus, hypothalamus
Lateral ventricles, III. ventricle, IV. ventricle
Hemispheres
Internal carotid artery (course, parts and branches)
Vertebral artery (course and branches)
Circle of Willis
Veins of the brain
Cranial nerve nuclei, macroscopy of cranial nerves together with the brain, dural and skull exits
Branches of cranial nerves (CN 3, CN 4, CN 5, CN 6, CN 7, CN 9, CN 10, CN 11, CN 12)
General composition of the autonomic nervous system
Sympathetic nervous system (cranial, cervical, thoracic and lumbar parts)
Sympathetic trunk
Parasympathetic system (cranial and sacral parts)
Topography of the orbit. Extraocular muscles. Eye movements.
Eyelids, conjunctiva, fasciae of the orbit, lacrimal apparatus

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EM I Microscopic Anatomy and Embryology I. Announcements

SUBJECT MATTER OF THE SEMESTER

I. Microscopy of basic tissues

Simple, stratified and glandular epithelia, connective & supporting tissues, muscle tissues, blood, bone marrow

II. Microscopical strucure of internal organs

Cardiovascular, gastrointestinal, respiratory and urogenital systems and elements of the peripheral nervous system apparent in the organs

ACCEPTENCE OF THE SEMESTER:

Active participation in dissection room sessions is obligatory for every student. Students should attend at least 75% of the scheduled hours, including the midterm tests, to gain a signature proving the validity of the semester. Absences are therefore limited in **25%**. Attendance will be recorded in the dissection room classes.
Midterm absences should be made up for on selected retake dates.

Attendance at practical classes is obligatory

Students should present themselves well prepared and on time to start with the dissection work. Attendance is regularly checked and students will have to sign a presence sheet once the teacher has verified their presence.
Students unfit to start the practical class at the **starting time specified in the time table** will be recorded as „*being late*". According to the *Study policy 28. § 12. point* - 3 (three) such occasions of „*being late*„ will add up to a **recorded absence**.
Furthermore, students arriving later than 5 minutes past the starting time may participate in the class but their presence will not be recorded/accepted (i.e. counts as an absence).

MIDTERM TESTS

There are two written tests held in the Digital Histology Laboratories. Attendance is obligatory, in case of absence students will be offered two retake possibilities.

Midterm test 1 - Date: Week 5 (2nd class, March 17.)
Basic tissues (slides viewed during weeks 1-4)
1st retake: week 6 (1st class); 2nd retake: week 13 (1st class)
Midterm test 2 Date: Week 11 (2nd class, April 28.)
Histology of organs (except for the female genital tract);
1st retake: week 12 (1st class); 2nd retake: week 13 (1st class)

EXEMPTIONS - Students may earn an ***exemption*** *from the written part of the semifinal examination with a 4 or a 5 calculated from the average of the two written tests. A mark 4 (good) can be earned if the midterm average is 4,00; while a mark 5 (excellent) will be earned if the average of the midterm marks is at least 4,50.

SEMIFINAL EXAMINATION

Topics: Subject matter of the semester (Microscopic Anatomy and Embryology I.)

The semifinal examination consists of practical and theoretical parts:

1. Written pretest - unless exempted*(Microscopic Anatomy and Embryology questions)
2. Oral examination (Identification of structures on a digital slide including relevant theoretical question

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Microscopic Anatomy I. EM 1-12

Week	Lectures *EM 1-10, 23,24 Mon 10.00-10.45*	Lecturers	Histology Laboratories (2x90 minutes) *EM 1-6 Thurs Fri* *EM 7-12 (24) Mon Fri*
.**Week 1** 02.13 - 02.17	1 Epithelial tissues, cell contacts, intercellular connections Glandular epithelium	1 Kocsis	Epithelial tissues I. **3, 91a, 57,** *40*, **8b** Epithelial tissues II. **5, 6, 7a**, **99a, 52, 148, 11,** *52a*
Week 2 02.20 - 24.	2 Connective tissue cells and fibres. Extracellular matrix	2 Vereczki	Connective tissue cells **12, 6, 57, 40, 155** Connective tissue fibres **6, 73, 91b,** *87*
Week 3 02.27- 03.03.	3 Supporting tissues (cartilage, bone)	3 Kocsis	CT types: **12, 6, 18, 99a, 84;** Blood **37** Supporting tissues **24b, 98, 35,** *60,* **27, 25, 26, 2**
Week 4 03.06 - 10.	4 Ossification, bone remodelling	4 Dóra	Types of bone formation **28b, 31** Nerve tissue **88, 67**
Week 5 03.13 - 03.17. ***03.15. National holiday***	5 Muscle tissues	5 Barna	Types of muscle tissues **33, 5, 41,** *83* ***MIDTERM 1 - Basic tissues***
Week 6 03.20 -24.	6 Histology of vessels	6 Minkó	Histology of vessels **91a, 38, 34,** *91b, 109, 154, 153* Lip, tongue, lingual papillae **92, 34, 49, 50**
Week 03.27 – 31.**7**	7. Histology of the tongue and teeth Histology of the esophagus	7 Vereczki	EM 1-6 Teeth, tooth bud **54a-b, 55** ***EM 7-12 Teeth, tooth bud 54a-b, 55 Salivary glands 52a, 9, 51, 52*** EM 1-6 Salivary glands **52a, 9, 51,** *52* ***EM 7-12 Esophagus, stomach 5, 62a, 63, 64***
Week 8 04.03 - 07. ***Friday is holiday***	8 Histology of the stomach. Microscopical anatomy of the small and large intestines	8 Zsiros	EM 1-6 Esophagus, stomach **5, 62a, 63, 64** ***EM 7-12 Intestines 65a, 65c, 66, 65b, 156b, 99a, 99b, 68, 69a, 69b*** ***Easter holiday - no Histology class***
Week 9 04.10 - 14. ***Easter Monday is holiday***	9 ***Easter Monday*** ~~Histology of the liver and pancreas~~	9 -------	***Easter Monday - no Histology class for groups EM 7-12*** ***EM 1-6 (Thurs)*** Intestines **65a, 65c, 66,** *65b,* **156b, 99a, 99b, 68, 69a,** *69b* Liver; gall bladder, pancreas 71a,71c, 72b, 73; 3, 70
Week 10 04.17- 21.	10 Histology of the airways	10 Katz	Epiglottis, larynx **56, 17** Trachea, lung **57, 58, 60**, *61*
Week 11 04.24 -28.	11 Microscopical anatomy of urinary organs	11 Katz	EM 1-6 Kidney, ureter, urinary bladder **74, 76, 77, 8a-b** ***MIDTERM 2 - histology of internal organs (except for the genital organs)*** ***EM 7-12 Histology of the male genital system I. 78a-b, 78c, 90***
Week 12 05.01 - 05.	12 Histology of the male genital system	12 Dobolyi	***May 1 - no Histology class for EM 7-12*** EM 1-6 Histology of the male genital system I. **78a-b, 78c, 90** Histology of the male genital system II. **81, 89a, 7a, 7b**, *7c*
Week 13 05.08 - 12.	13 Histology of the female genital system I.	13 Zsiros	Histology of the female genital system I. **82, 97a-b, 94** Histology of the female genital system II. **84, 95, 87a-b, 115**
Week 14 05.15 - 19.	14 Histology of the female genital system II. Placenta, mammary gland	14 Minkó	Placenta **12, 86, 85a**, *85b* Mammary gland Revision

Academic Year 2022/2023 Faculty of Medicine

Microscopic Anatomy I. EM 13-24

Week	Lectures *EM 11-22 Wed 11.45-12.30*	Lecturers	Histology Laboratories (2x90 minutes) *EM 13-17 (23) Mon Fri EM 18-21 (22) Mon Fri*
.**Week 1** 02.13 - 02.17	1 Epithelial tissues, cell contacts, intercellular connections. Glandular epithelium	1 Lendvai	Epithelial tissues I. **3, 91a, 57,** *40*, **8b** Epithelial tissues II. **5, 6, 7a**, **99a, 52, 148, 11,** *52a*
Week 2 02.20 - 24.	2 Connective tissue cells and fibres. Extracellular matrix	2 Pálfi	Connective tissue cells **12, 6, 57, 40, 155** Connective tissue fibres **6, 73, 91b,** *87*
Week 3 02.27- 03.03.	3 Supporting tissues (cartilage, bone)	3 Kocsis	CT types: **12, 6, 18, 99a, 84;** Blood **37** Supporting tissues **24b, 98, 35,** *60,* **27, 25, 26, 2**
Week 4 03.06 - 10.	4 Ossification, bone remodelling	4 Dóra	Types of bone formation **28b, 31** Nerve tissue **88, 67**
Week 5 03.13 - 03.17. ***03.15. National holiday***	5 ***National Holiday*** ~~*Muscle tissues*~~	5 ----------	Types of muscle tissues **33, 5, 41,** *83* ***MIDTERM 1 - Basic tissues***
Week 6 03.20 - 24.	6 Histology of vessels	6 Minkó	Histology of vessels **91a, 38, 34,** *91b, 109, 154, 153* Lip, tongue, lingual papillae **92, 34, 49, 50**
Week 03.27 – 31.	7 Histology of the tongue and teeth. Histology of the esophagus	7 Vereczki	Teeth, tooth bud **54a-b, 55** Salivary glands **52a, 9, 51,** *52* Esophagus, stomach **5, 62a, 63, 64**
Week 8 04.03 - 07. ***Friday is holiday***	8 Histology of the stomach. Microscopical anatomy of the small and large intestines	8 Zsiros	Intestines **65a, 65c, 66,** *65b,* **156b, 99a, 99b, 68, 69a,** *69b* ***Easter holiday - no Histology class***
Week 9 04.10 - 14. ***Easter Monday is holiday***	9 Histology of the liver and pancreas	9 Dobolyi	***Easter Monday No histology class for EM 11-21 (22,23,24)*** Liver, gall bladder, pancreas **71a, 71c, 72b, 73; 3, 70**
Week 10 04.17- 21.	10 Histology of the airways	10 Katz	Epiglottis, larynx **56, 17** Trachea, lung **57, 58, 60**, *61*
Week 11 04.24 - 28.	11 Microscopical anatomy of urinary organs	11 Katz	Kidney, ureter, urinary bladder **74, 76, 77, 8a-b** ***MIDTERM 2 - histology of internal organs (except for the genital organs)*** Histology of the male genital system I. **78a-b, 78c, 90**
Week 12 05.01 - 05.	12 Histology of the male genital system	12 Kocsis	***May 1 - no Histology class*** Histology of the male genital system II. **81, 89a, 7a, 7b**, *7c*
Week 13 05.08 - 12.	13 Histology of the female genital system I.	13 Zsiros	Histology of the female genital system I. **82, 97a-b, 94** Histology of the female genital system II. **84, 95, 87a-b, 115**
Week 14 05.15 - 19.	14 Histology of the female genital system II. Placenta, mammary gland	14 Minkó	Placenta **12, 86, 85a**, *85b* Mammary gland Revision

Microscopic Anatomy I. Faculty of Medicine 2022/ 2023 EM I
GENERAL ORDER OF TOPICS AND SLIDES

Week	Histological specimens
Week 1	**Simple and stratified epithelial tissues** 3. Simple columnar epithelium (biliary vesicle, HE) 91.Simple squamous epithelium (aorta, human, HE) 57. Pseudostratified simple columnar epithelium - Trachea (human, HE) 8.b Transitional epithelium - Urinary vesicle (monkey, HE) *40. Lymph node (semithin section; rat, toluidine blue)* --- **Simple and stratified epithelial tissues** 5. Stratified non-keratinizing squamous epithelium - Esophagus: upper and middle portions (human, HE) 6. Stratified keratinizing squamous epithelium - Plantar skin (human, HE) 7.a Stratified columnar epithelium - Penis (human, HE) **Glandular epithelium** 99.a Goblet cells - Ileum (HE) 52. Merocrine secretion (seromucous) - Submandibular gland (human, HE) 148. Apocrine secretion - Axillary skin (human, HE) 11. Holocrine secretion - Hairy skin (HE) *52a. Submandibular gland (human, Movat pentachrome*)
Week 2	Connective tissue fibres and cells. Connective tissue types. 12. Umbilical cord (newborn human, HE) 6. Plantar skin (human, HE) 57. Trachea (human, HE) 40. Lymph node (semithin section; rat, toluidine blue) 155 Granulation tissue (connective tissue cells (HE) --- 6. Plantar skin (human, HE) 73. Liver (human, silver nitrate impregnation) 91.b Aorta (resorcin-fuchsin) 87. Vagina (human, trichrome)
Week 3	**Types of connective tissue** 12. Umbilical cord (newborn human, HE) 99.a Ileum (human, HE) 6. Plantar skin (human, HE) 18. Tendon (human, HE) 84. Uterus (human, HE) 37. Blood smear (May-Grünwald-Giemsa = MGG) --- **Supporting tissues (cartilage, bone)** 24. Hyaline cartilage (human costal cartilage, HE) 25. Compact bone (cross section, Schmorl's picrothionin stain) 98. Auricule (human, Verhoeff's stain) 26. Compact bone (longitudinal section, Schmorl's stain) 35. Meniscus (human, HE) 2. Trabecular bone, bone marrow, (body of vertebra+intervertebral disc, human, HE) 27. Cross section of a long bone (human ulna, unstained) *60. Hyaline cartilage (lung , human, semithin section, toluidine blue)*
Week 4	**Types of ossification, bone restructuring** 28.b Intramembranous ossification (calvary, human, AZAN) 31. Endochondral ossification (Week 17 human fetus, longitudinal section of developing foot, HE) --- **Nerve tissue** 88. Peripheral nerve (sciatic nerve, longitudinal and cross sections, human, HE) 67. Multipolar nerve cell (celiac ganglion, human, Bielschowsky's impregnation)
Week 5	**Smooth, skeletal and cardiac muscle types** 33. Skeletal muscle (iron hematoxylin) 5. Smooth muscle and visceral striated muscle (esophagus: upper and middle portions, human, HE) 41. Cardiac muscle (human, HE) *83. Eberth's line, heart, atrioventricular node (human, trichrome)* --- **MIDTERM 1. Basic tissues**

Week 6	**Histology of blood vessels** 91. Large artery of elastic type (aorta, human, HE) 38. Medium size artery and vein (femoral vessels, Movat) 34. Small arteries, arterioles and small veins, venules (tongue, human, HE) *91b. Elastic artery (aorta, resorcin fuchsin)* *109. Capillaries (pancreas, semithin section, rat, toluidine blue)* *154. Pericyte (skin of human abdominal wall, α-smooth muscle actin (SMA) immunocytochemistry)* *153. Arteriovenous anastomosis /glomus organ (fingertip, human hand, HE* --- **Gastrointestinal tract** 92. Lip (HE) 34. Tongue: *filiform and fungiform papillae* (HE) 49. Tongue: *circumvallate papillae* (HE) 50. Tongue; foliate papillae (human + monkey or rabbit, HE)
Week 7	**Gastrointestinal tract** 54.a, b Ground tooth (unstained) 55. Developing tooth (AZAN) --- 9. Sublingual and submandibular glands (human, HE) 51. Parotid gland (HE) *52. Submandibular gland (human, HE)* 52a. Submandibular gland (Movat)
Week 8	5. Esophagus: upper and middle portions (human, HE) 62. Stomach, fundus (HE) 63. Gastro-esophageal junction - cardia (HE) 64. Pylorus (gastroduodenal junction, HE**)** --- 65.a Duodenum (HE) 156.b Jejunum (HE) 65.c Duodenum (animal**,** HE) 99. a,b Ileum (human, HE) 66. Duodenum (human, alcian blue H picrosirius red) 68. Colon (human, HE) *65.b Duodenum (human PAS +H)* 69. Vermiform appendix (human, HE) 69.b Vermiform appendix (aged, human, HE9
Week 9	71.a Liver (human, HE) 3. Biliary vesicle: fundus & neck (human, HE) 71.c Liver (human, SMA ICC/H) 70. Pancreas (HE) 72.b Liver (human, HE) 73. Liver (human, silver impregnation) ---
Week 10	**Respiratory system** 57. Trachea (HE) 56. Epiglottis (HE) 58. Lung (HE) 17. Larynx (HE) 60. Lung (toluidine blue) --- 61. Fetal lung (human, HE
Week 11	**Urinary system** 74. Kidney (HE) 76. Kidney (semithin, toluidine blue) 77. Ureter (HE) 8.a,b Urinary vesicle (monkey, HE) --- **MIDTERM 2. Histology of internal organs (except for the genital organs)**
Week 12	**Male genital system** 81. Prostate (aged, human, HE) 78.a, b Testicle (human,HE) 89.a Seminal vesicle (HE) 78.c Epididymis (human, HE) 7.a Penis (human, *HE)* 90. Spermatic cord (human, trichrome) 7.b Glans penis (HE) --- *7.c Penis (human, Verhoeff's elastic stain)*
Week 13	**Female genital tract** 84. Uterus, proliferation's phase (human, HE) 82. Ovary (rabbit, HE) 95. Uterus, secretory phase (HE) 97.a, b Corpus luteum (human, HE) 87. Vagina (human, trichrome) 94. Fallopian tube, isthmus and ampulla (human, HE) 87.a Vagina (human, HE) ---
Week 14	12. Umbilical cord of a newborn (human, HE) Mamma non-lactans (HE) 86. Placenta (6th week of pregnancy, human, HE) Mamma Lactans (HE) 85a. Placenta (mature (delivered), human, HE) *85b. Placenta (mature, human, pan-cytokeratin ICC)* --- ***REVISION***

Topics of the semifinal examination in Microscopic Anatomy I

General Histology

Concept of basic tissues
Definition and classification of epithelial tissue
Simple epithelia
Stratified epithelia
Membrane specializations of epithelia
Glandular epithelia
Pigment epithelium, sensory neuroepithelium
Cells of connective tissue
Ground substance and fibres of connective tissue
Types of connective tissue
Blood and the corpuscular elements of blood
Histology of the bone marrow, maturation of erythrocytes and platelets
Differentiation of granulocytes, lymphocytes and monocytes
Histology of cartilage
Histology of the bone tissue
Intramembranous ossification
Endochondral ossification
Growth and remodeling of bone
Smooth muscle and myoepithelial cells
Skeletal muscle tissue
Cardiac muscle tissue
Nervous tissue

Histology of organs

Histology of lymph organs (lymph node, MALT/ tonsilles, spleen, thymus)
Histological structure of arteries and arterioles
Composition of capillaries and veins
Wall structure of hollow organs
Histology of the lip, tongue and teeth
Structure of the esophagus
Histology of the airways (epiglottis, larynx, trachea, lung)
Histology of the stomach
Structure of the small and large intestines
Histology of the liver and biliary passages including the gall bladder
Histology of the pancreas
Histology of the kidney and the urinary passages (ureter, urinary bladder)
Histology of the testicles togeteher with the epididymis
Histology of the prostate, seminal vesicle, spermatic cord
Histology of the penis
Histology of the ovary, uterine tube; corpus luteum
Histology of the uterus
Histology of the vagina
Histology of the mammary gland
Placenta, umbilical cord

RECOMMENDED LITERATURE

List of textbooks

- Sobotta Atlas of Human Anatomy, 15th English ed. Musculoskeletal system, internal organs, head, neck, neuroanatomy, By Waschke & Paulsen, ISBN-13: 9780702052507 2013
- Gray's Anatomy for students with STUDENT CONSULT Online Access, 3rd Edition by R. Drake, A. W. Vogl, A. Mitchel, Elsevier; 2014; ISBN 9780702051319
- THIEME Atlas of Anatomy, General Anatomy and Musculoskeletal System, 2014 by Schuenke, ISBN: 9781604069228
- THIEME Atlas of Anatomy, Head, Neck and Neuroanatomy, 2016 by Schuenke, ISBN: 9781626231207
- THIEME Atlas of Anatomy, Internal Organs, 2016 by Schuenke, ISBN: 9781626231665
- McMinn and Abrahams' Clinical Atlas of Human Anatomy with STUDENT CONSULT Online Access , 7th Edition By Abrahams, Spratt, Loukas & van Schoor ISBN-13: 9780723436973 , 2013
- Netter: Atlas of Human Anatomy, Including Student Consult Interactive Ancillaries and Guides, 6th Edition, 2014.
- Human Anatomy, Color Atlas and Textbook, 6th Edition by J Gosling, P Harris, J Humpherson, I Whitmore and P Willan; ISBN 9780723438274 Elsevier, 2016.
- Functional Anatomy, Histology and Embryology for medical and dental students by M. Réthelyi and J. Szentágothai, Medicina, 2018.

- *Gray's Anatomy. The Anatomical Basis of Clinical Practice; 41st edition by S. Standring: 2015 ISBN : 9780702052309*
- *Netter's Clinical Anatomy with Online Access, 3rd Edition, by J. Hansen, 2014,* ***eBook ISBN:*** *9781455770632* ***eBook ISBN:*** *9780323312899 014*
- *Anatomy, A Photographic Atlas, 8th Edition by Rohen, Yokochi; Wolters Kluwer, 2016, ISBN: 978-1-4963-0870-2*
- *Bräuer: Sobotta Flashcards (Muscles; Bones, Ligaments, and Joints) URBFI, 2013.*
- *RMH McMinn: Last's Anatomy, Regional and Applied. Churchill Livingstone, Edinburgh 1990. ISBN 0-443-03484-4*

- Langmann's Medical Embryology, 13th Edition by TW Sadler, Wolters Kluwer, ISBN 9781469897806, 2014
- Histology: A Text and Atlas: With Correlated Cell and Molecular Biology; 7th Edition by MH Ross and W Pawlina ; Wolters Kluwer 2015, ISBN 9781451187427
- *Wheater's Functional Histology, A Text and Colour Atlas, 6th Edition by B Young, G O'Dowd and P Woodford Churchill Livingstone, Edinburgh, 2013, ISBN 9780702047473*
- Stevens & Lowe's Human Histology , Elsevier, 4th edISBN 978-0-723435020, 2015.

- Functional Anatomy, Histology and Embryology for medical and dental students by M. Réthelyi and J. Szentágothai, Medicina, 2018.

- *The Developing Human – Clinically Oriented Embryology, 10th ed. by KL Moore, TVN Persaud and M Torchia, Saunders, 2015; ISBN 9780323313384*
- *Histology Manual 1-3. by A. Nemeskéri and K. Kocsis: István Apáthy's Foundation, 2019.*
- *L. Kierszenbaum Histology and Cell Biology: An Introduction to Pathology, 4th Edition, Paperback with STUDENT CONSULT Online Access and E-Book ISBN: 9780323085885:, 2015*
- *Junqueira's Basic Histology: Text and Atlas; 13th Edition by Anthony Mescher, New York, McGraw-Hill Medical, 01/03/2013 ISBN13 978007178033*

- *Regional Anatomy, by T Tömböl, Medicina 2008, ISBN 963 242 186 8*
- *Sectional Anatomy – Workbook, by A. Nemeskéri; István Apáthy's Foundation, 2001.*
- *Neuroanatomy An Illustrated Colour Text, 4th Edition by Crossman & Neary Publication* Date*: 13/04/2010 ISBN-13: 97807020308*

Further study aids:

To be downloaded from the homepage of the Department of Anatomy, Histology and Embryology (http://semmelweis.hu/anatomia) or from Knowledgebase on the Library homepage: (https://lib.semmelweis.hu/knowledge_base).