

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

**Faculty of Medicine**  
**1<sup>st</sup> year, 2<sup>nd</sup> 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

Department of Anatomy, Histology and Embryology

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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, scissors) 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: 3x45 min Macroscopic Anatomy and Embryology II and 1x 45 min Microscopic Anatomy and Embryology I; third semester: 2x 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*

*1<sup>st</sup> retake date: Week 8 (Thursday or Friday), 2<sup>nd</sup> 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*

*1<sup>st</sup> and 2<sup>nd</sup> 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 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 identified 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.***

**Academic Year 2022/2023      Faculty of Medicine**  
**Macroscopic Anatomy and Embryology II.      EM 1-12**

Week	Lectures <i>EM 1-12 Mon 11.00-11.45, Wed 14.45-16.25</i>	EM 1-12 Lecturers	Dissection room classes <i>EM 1-6 Tue Wed Fri</i> <i>EM 7-12 (24) Mon Tue Thurs</i>
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 3	Dissection /inspection of the wall and cavities of the head and neck region Dissection /inspection of the cervical internal organs  Opening of the thorax, dissection of the thoracic cavity Opening of the abdominal cavity, dissection /inspection of the abdominal organs
Week 2 02.20 - 24.	4 Pharynx, esophagus 5 Larynx 6 Development of the face, malformations	4 5 Alpár 6	
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 8 9	
Week 4 03.06 - 10.	10 Development of the heart <b>Development of arteries and veins</b> 11 Morphology of trachea and the lung. Pleura. 12 Development of the respiratory system. Postpartum adaptation of the circulatory system	10 11 12	
Week 5 03.13 - 03.17. 03.15. <i>National holiday</i>	<b>13 Stomach and small intestines (duodenum, jejunum, ileum)</b> <b>14 March 15 – National holiday</b> <b>15 March 15 – National holiday</b>	13 14 15	
Week 6 03.20 -24.	<b>16 Liver, gall bladder, pancreas, spleen</b> 17 Large intestine, rectum <b>Development of the midgut and hindgut</b> 18 Peritoneal relations of abdominal organs. Development of the peritoneum, separation of body cavities	16 17 18	
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 <b>Morphology of the epididymis, spermatic cord, seminal vesicle and prostate</b>	19 20 21	Dissection /inspection of the abdominal organs  <b>Midterm 1 Morphology and development of the internal organs of the head&amp;neck, thorax and abdomen.</b>
Week 8 04.03 - 07. <i>Friday is holiday</i>	22 Morphology of penis and male urethra. Male perineum 23 Ovary, Fallopian tube and uterus 24 Vagina, female perineum, external genital organs	22 23 24	Dissection/ inspection of the retroperitoneal organs and perineum together with organs of the lesser pelvis
Week 9 04.10 - 14. <i>Easter Monday is holiday</i>	<b>25 Easter Monday</b> 26 Development of the urinary system 27 Development of genital organs	25 26 27	
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 29 30	
Week 11 04.24 -28.	31 Topography and components of the basal ganglia and the diencephalon (thalamus, hypothalamus), the 3 <sup>rd</sup> ventricle. 32 Topography and components of the brainstem (midbrain, pons and medulla oblongata), the 4 <sup>th</sup> ventricle 33 Arterious, venous and lymphatic circulation of the brain	31- 32 33	Dissection/ inspection of the brain and spinal cord. Intracranial spaces.
Week 12 05.01 - 05.	<b>34 May 1</b> 35 The autonomic nervous system. Sympathetic and parasympathetic nervous systems 36 Cranial nerve nuclei. Trigeminal nerve (CN 5)	34 35 36	
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 <b>Intracranial topography, orbit</b> <b>COMPETITION (1st round - TBA)</b>	37 38 39	Cranial nerve branches  <b>Midterm 2. Retroperitoneum. Morphology and development of the pelvic organs. Macroscopy of CNS. Intracranial topography</b>
Week 14 05.15 - 19.	40 <b>Lymphatic system. Regional lymphatic drainage of organs, lymph nodes</b> 41 Topographical relations of the thoracic cavity 42 Topographical relations of the abdominal cavity <b>COMPETITION (2nd round - TBA)</b>	40 41 42	Cross sectional anatomy Revision

**Academic Year 2022/2023 Faculty of Medicine**  
**Macroscopic Anatomy and Embryology II. EM I 13-24**

Week	Lectures <i>EM 13-20 Wed 12.30-13.15, Thurs 10.00-11.40</i>	EM 13-24 Lecturers	Dissection room classes <i>EM 13-17, 23 Tue Wed Fri</i> <i>EM 18-22 Mon Thurs Fri</i>
Week 1 02.13 - 02.17.	1 Nasal cavity, paranasal sinuses 2 Oral cavity, tongue, palate, faucial isthmus 3 Salivary glands	1 Székely 2 3	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 5 6 Alpár	
Week 3 02.27- 03.03.	7 Development of the face, malformations <b>Development of the pharyngeal arches</b> 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 8 9	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 <b>Morphology of trachea and the lung. Pleura.</b>	10 11 12	
Week 5 03.13 - 03.17. 03.15. <i>National holiday</i>	<b>13 March 15 - National Holiday</b> 14 Development of the respiratory system. Postpartum adaptation of the circulatory system 15 Stomach and small intestines (duodenum, jejunum, ileum)	13 14 15	
Week 6 03.20 -24.	16 Liver, gall bladder, pancreas, spleen. 17 Large intestine, rectum 18 Development of the <b>foregut</b> , midgut and hindgut	16 17 18	
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 20 21	Dissection /inspection of the abdominal organs <b>Midterm 1 Morphology and development of the internal organs of the head&amp;neck, thorax and abdomen.</b>
Week 8 04.03 - 07. <i>Friday is holiday</i>	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 23 24	Dissection/ inspection of the retroperitoneal organs and perineum together with organs of the lesser pelvis
Week 9 04.10 - 14. <i>Easter Monday is holiday</i>	25 Vagina, female perineum, external genital organs 26 Development of the urinary system 27 Development of genital organs	25 26 27	
Week 10 04.17- 21.	28 Topographical divisions of the central nervous system, developmental units 29 Meninges, epidural and subarachnoidal 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 29 30	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 3 <sup>rd</sup> ventricle. 32 Topography and components of the brainstem (midbrain, pons and medulla oblongata), the 4 <sup>th</sup> ventricle. 33 Arterious, venous and lymphatic circulation of the brain	31 32 33	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 35 36	
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 <b>COMPETITION (1st round - TBA)</b>	37 38 39	Cranial nerve branches <b>Midterm 2. Retroperitoneum. Morphology and development of the pelvic organs. Macroscopy of CNS. Intracranial topography</b>
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 <b>COMPETITION (2nd round - TBA)</b>	40 41 42	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 structure 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)

**Academic Year 2022/2023 Faculty of Medicine**

**Microscopic Anatomy I. EM 1-12**

Week	Lectures <i>EM 1-10, 23,24 Mon 10.00-10.45</i>	Lecturers	Histology Laboratories (2x90 minutes)	
			<i>EM 1-6 Thurs Fri</i>	<i>EM 7-12 (24) Mon Fri</i>
Week 1 02.13 - 02.17	1 Epithelial tissues, cell contacts, intercellular connections Glandular epithelium	1	Epithelial tissues I. <b>3, 91a, 57, 40, 8b</b>	Epithelial tissues II. <b>5, 6, 7a, 99a, 52, 148, 11, 52a</b>
Week 2 02.20 - 24.	2 Connective tissue cells and fibres. Extracellular matrix	2	Connective tissue cells <b>12, 6, 57, 40, 155</b>	Connective tissue fibres <b>6, 73, 91b, 87</b>
Week 3 02.27- 03.03.	3 Supporting tissues (cartilage, bone)	3	CT types: <b>12, 6, 18, 99a, 84;</b> Blood <b>37</b>	Supporting tissues <b>24b, 98, 35, 60, 27, 25, 26, 2</b>
Week 4 03.06 - 10.	4 Ossification, bone remodelling	4	Types of bone formation <b>28b, 31</b>	Nerve tissue <b>88, 67</b>
Week 5 03.13 - 03.17. <b>03.15.</b> <i>National holiday</i>	5 Muscle tissues	5	Types of muscle tissues <b>33, 5, 41, 83</b>	<b>MIDTERM 1 - Basic tissues</b>
Week 6 03.20 -24.	6 Histology of vessels	6	Histology of vessels <b>91a, 38, 34, 91b, 109, 154, 153</b>	Lip, tongue, lingual papillae <b>92, 34, 49, 50</b>
Week 03.27 – 31.7	7. Histology of the tongue and teeth Histology of the esophagus	7	EM 1-6 Teeth, tooth bud <b>54a-b, 55</b> <b>EM 7-12 Teeth, tooth bud 54a-b, 55 Salivary glands 52a, 9, 51, 52</b>	EM 1-6 Salivary glands <b>52a, 9, 51, 52</b> <b>EM 7-12 Esophagus, stomach 5, 62a, 63, 64</b>
Week 8 04.03 - 07. <i>Friday is holiday</i>	8 Histology of the stomach. Microscopical anatomy of the small and large intestines	8	EM 1-6 Esophagus, stomach <b>5, 62a, 63, 64</b> <b>EM 7-12 Intestines 65a, 65c, 66, 65b, 156b, 99a, 99b, 68, 69a, 69b</b>	<b>Easter holiday - no Histology class</b>
Week 9 04.10 - 14. <i>Easter Monday is holiday</i>	9 <b>Easter Monday</b> Histology of the liver and pancreas	9	<b>Easter Monday - no Histology class for groups EM 7-12</b> <b>EM 1-6 (Thurs) Intestines 65a, 65c, 66, 65b, 156b, 99a, 99b, 68, 69a, 69b</b>	Liver; gall bladder, pancreas <b>71a,71c, 72b, 73; 3, 70</b>
Week 10 04.17- 21.	10 Histology of the airways	10	Epiglottis, larynx <b>56, 17</b>	Trachea, lung <b>57, 58, 60, 61</b>
Week 11 04.24 -28.	11 Microscopical anatomy of urinary organs	11	EM 1-6 Kidney, ureter, urinary bladder <b>74, 76, 77, 8a-b</b>	<b>MIDTERM 2 - histology of internal organs (except for the genital organs)</b> <b>EM 7-12 Histology of the male genital system I. 78a-b, 78c, 90</b>
Week 12 05.01 - 05.	12 Histology of the male genital system	12	<b>May 1 - no Histology class for EM 7-12</b> EM 1-6 Histology of the male genital system I. <b>78a-b, 78c, 90</b>	Histology of the male genital system II. <b>81, 89a, 7a, 7b, 7c</b>
Week 13 05.08 - 12.	13 Histology of the female genital system I.	13	Histology of the female genital system I. <b>82, 97a-b, 94</b>	Histology of the female genital system II. <b>84, 95, 87a-b, 115</b>
Week 14 05.15 - 19.	14 Histology of the female genital system II. Placenta, mammary gland	14	Placenta <b>12, 86, 85a, 85b</b> Mammary gland	Revision

**Academic Year 2022/2023 Faculty of Medicine**

**Microscopic Anatomy I. EM 13-24**

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

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

Week	Histological specimens
<p align="center"><b>Week 1</b></p>	<p><b>Simple and stratified epithelial tissues</b></p> <ul style="list-style-type: none"> <li>3. Simple columnar epithelium (biliary vesicle, HE)</li> <li>91.Simple squamous epithelium (aorta, human, HE)</li> <li>57. Pseudostratified simple columnar epithelium - Trachea (human, HE)</li> <li>8.b Transitional epithelium - Urinary vesicle (monkey, HE)</li> <li>40. <i>Lymph node (semithin section; rat, toluidine blue)</i></li> </ul> <hr/> <p><b>Simple and stratified epithelial tissues</b></p> <ul style="list-style-type: none"> <li>5. Stratified non-keratinizing squamous epithelium - Esophagus: upper and middle portions (human, HE)</li> <li>6. Stratified keratinizing squamous epithelium - Plantar skin (human, HE)</li> <li>7.a Stratified columnar epithelium - Penis (human, HE)</li> </ul> <p><b>Glandular epithelium</b></p> <ul style="list-style-type: none"> <li>99.a Goblet cells - Ileum (HE)</li> <li>52. Merocrine secretion (seromucous) - Submandibular gland (human, HE)</li> <li>148. Apocrine secretion - Axillary skin (human, HE)</li> <li>11. Holocrine secretion - Hairy skin (HE)</li> <li>52a. <i>Submandibular gland (human, Movat pentachrome)</i></li> </ul>
<p align="center"><b>Week 2</b></p>	<p>Connective tissue fibres and cells. Connective tissue types.</p> <ul style="list-style-type: none"> <li>12. Umbilical cord (newborn human, HE)</li> <li>6. Plantar skin (human, HE)</li> <li>57. Trachea (human, HE)</li> <li>40. Lymph node (semithin section; rat, toluidine blue)</li> <li>155 Granulation tissue (connective tissue cells (HE)</li> </ul> <hr/> <ul style="list-style-type: none"> <li>6. Plantar skin (human, HE)</li> <li>73. Liver (human, silver nitrate impregnation)</li> <li>91.b Aorta (resorcin-fuchsin)</li> <li>87. Vagina (human, trichrome)</li> </ul>
<p align="center"><b>Week 3</b></p>	<p><b>Types of connective tissue</b></p> <ul style="list-style-type: none"> <li>12. Umbilical cord (newborn human, HE)</li> <li>6. Plantar skin (human, HE)</li> <li>18. Tendon (human, HE)</li> <li>37. Blood smear (May-Grünwald-Giemsa = MGG)</li> <li>99.a Ileum (human, HE)</li> <li>84. Uterus (human, HE)</li> </ul> <hr/> <p><b>Supporting tissues (cartilage, bone)</b></p> <ul style="list-style-type: none"> <li>24. Hyaline cartilage (human costal cartilage, HE)</li> <li>98. Auricule (human, Verhoeff's stain)</li> <li>35. Meniscus (human, HE)</li> <li>27. Cross section of a long bone (human ulna, unstained)</li> <li>25. Compact bone (cross section, Schmorl's picrothionin stain)</li> <li>26. Compact bone (longitudinal section, Schmorl's stain)</li> <li>2. Trabecular bone, bone marrow, (body of vertebra+intervertebral disc, human, HE)</li> <li>60. <i>Hyaline cartilage (lung , human, semithin section, toluidine blue)</i></li> </ul>
<p align="center"><b>Week 4</b></p>	<p><b>Types of ossification, bone restructuring</b></p> <ul style="list-style-type: none"> <li>28.b Intramembranous ossification (calvary, human, AZAN)</li> <li>31. Endochondral ossification (Week 17 human fetus, longitudinal section of developing foot, HE)</li> </ul> <hr/> <p><b>Nerve tissue</b></p> <ul style="list-style-type: none"> <li>88. Peripheral nerve (sciatic nerve, longitudinal and cross sections, human, HE)</li> <li>67. Multipolar nerve cell (celiac ganglion, human, Bielschowsky's impregnation)</li> </ul>
<p align="center"><b>Week 5</b></p>	<p><b>Smooth, skeletal and cardiac muscle types</b></p> <ul style="list-style-type: none"> <li>33. Skeletal muscle (iron hematoxylin)</li> <li>5. Smooth muscle and visceral striated muscle (esophagus: upper and middle portions, human, HE)</li> <li>41. Cardiac muscle (human, HE)</li> <li>83. <i>Eberth's line, heart, atrioventricular node (human, trichrome)</i></li> </ul> <hr/> <p><b>MIDTERM 1. Basic tissues</b></p>

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

## 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 together 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) URBF1, 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 ed ISBN 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](https://lib.semmelweis.hu/knowledge_base)).