



## SEMMELWEIS UNIVERSITY

Doctoral School - Health Sciences Division

Head of Division

DR. ZOLTÁN ZSOLT NAGY

### Semmelweis University Doctoral School Health Sciences Division

#### Complex exam information

(Program 1. and 2.)

Valid from February 2025\*

\* Mandatory for individual ("untrained") candidates and students admitted in February 2025 and thereafter, optional for previously enrolled students

*During the theoretical part of the comprehensive exam, based on the decision of the examination committee chair, the committee asks questions from the main and the additional subject topics, or the student draws topics from a set.*

**Selectable Main Subjects** (topics listed on the following pages):

- Anatomy
- Physiology
- Pathology
- Radiology
- Internal Medicine – Gastroenterology
- Ophthalmology
- Pediatrics
- Health Sciences

**Additional subject:** *With the help of their supervisor, the examinee defines the title of the additional subject, covering a narrower scientific field related to their research topic, and compiles a list of 8–10 topics from its subfields.*

**The chosen main subject and the title and topic list of the additional subject must be submitted to the Secretariat of the Health Sciences Division at the time of application for the complex exam.**

## Major Subject Topic Lists

### Anatomy:

1. Bones and joints of the shoulder joint
2. Bones and joints of the elbow joint
3. Bones and joints of the wrist joint
4. Bones and joints of the hip joint
5. Bones and joints of the knee joint
6. Bones and joints of the upper and lower ankle joint
7. Anatomical course and function of the muscles moving the shoulder joint
8. Anatomical course and function of the muscles moving the elbow joint
9. Anatomical course and function of the muscles moving the wrist joint
10. Anatomical course and function of the muscles moving the hip joint
11. Anatomical course and function of the muscles moving the knee joint
12. Anatomical course and function of the muscles moving the upper and lower ankle joint
13. Anatomy of the spine – bones and joints
14. Anatomical course and function of the muscles stabilizing and moving the trunk
15. Methodology of quantitative research design

### Physiology:

1. Homeostasis and allostasis
2. Blood and hematopoiesis
3. Structure and function of the immune system: cellular and humoral immunity, complement systems
4. Structure and function of the heart and circulation, regulation of circulation
5. Structure and function of the digestive system: nutrients, regulation of food intake, digestion, absorption
6. Structure and function of the respiratory system: gas exchange, respiratory movements
7. Excretory system: structure and function of the nephron, glomerular filtration, regulation of fluid and electrolyte balance, function of the urinary system, regulation of acid-base balance
8. Structure and function of the endocrine system: hypothalamus and pituitary, thyroid, parathyroid, adrenal glands, reproductive system
9. Sexual differentiation: genetic, gonadal, genital, and psychosexual sex; genetic, immunological, and epigenetic background and models of psychosexual identity

10. Structure and function of the nervous system, elementary neural phenomena
11. Sensory and motor functions
12. Autonomic nervous system
13. Methodology of quantitative research design

### **Pathology:**

1. Pathology of blood and hematopoiesis, thrombosis
2. Pathology of the immune system, especially autoimmune diseases
3. Pathology of the cardiovascular system, especially ischemic heart disease
4. Pathology of the digestive system, especially inflammatory bowel diseases, liver and pancreas diseases
5. Pathology of the respiratory system, especially disorders affecting gas exchange
6. Pathology and therapies of the excretory system
7. Pathology of the endocrine system, with special attention to common diseases and their development
8. Neurodegenerative diseases: prevention, diagnosis, treatment options, prognosis
9. Pathology of the musculoskeletal system
10. Methodology of quantitative research design

### **Radiology:**

1. Imaging diagnostic modalities and their applications
  - a. Diagnostic procedures involving ionizing radiation (conventional X-ray, fluoroscopy, CT, mammography, osteodensitometry (DEXA), nuclear medicine and isotope diagnostics)
  - b. Diagnostic procedures not involving ionizing radiation (MRI, ultrasound diagnostics)
2. Non-invasive imaging
3. Invasive imaging
4. Imaging modalities involving radiation exposure (X-ray, CT, mammography, DEXA, isotope diagnostics)
5. Contrast agents and their applications (CT and MRI contrast agents – indications, contraindications, complications; ultrasound contrast agents)
6. Basics of ultrasound methods (A-mode, B-mode, Doppler)
7. Basics of ultrasound methods (elastography, contrast-enhanced examinations)

8. Ultrasound-guided interventions
9. Ultrasound-guided ablations
10. Methodology of quantitative research design

### **Internal Medicine – Gastroenterology:**

1. Gastroesophageal reflux disease
2. Gastroduodenal ulcer disease and gastroduodenitis
3. Celiac disease and malabsorption disorders
4. Food allergies and intolerances
5. Ulcerative colitis
6. Crohn's disease
7. Irritable bowel syndrome (IBS)
8. Functional gastrointestinal disorders
9. Gallstone disease (cholecystolithiasis, choledocholithiasis)
10. Acute and chronic pancreatitis
11. Non-alcoholic steatohepatitis, alcoholic liver disease, chronic viral hepatitis (HBV, HCV), liver cirrhosis
12. Methodology of quantitative research design

### **Ophthalmology:**

1. Physiology of vision
2. Pathology of vision
3. Diseases of the anterior segment (cornea, lens, conjunctiva)
4. Diseases of the posterior segment
5. Glaucoma
6. Pediatric ophthalmologic conditions
7. Biochemical abnormalities and degenerative diseases of the lens
8. Relationship between visual and nervous system disorders (neuro-ophthalmology)
9. Treatment of corneal infections
10. Methodology of quantitative research design

### **Pediatrics:**

1. Characteristics of a healthy newborn

2. Characteristics of premature infants
3. Congenital developmental disorders
4. Pseudocroup
5. Childhood respiratory diseases
6. Surgical and medical causes of abdominal pain
7. Malabsorption
8. Urinary tract infection
9. Proteinuria
10. Epilepsy

**Health Sciences** (At least 10 topics must be selected):

- 1. Concepts and definitions of health and disease in different health science paradigms** (Bio-psycho-social model of health, WHO definition of health, alternative approaches)
- 2. Epidemiology and prevention of chronic diseases** (Prevalence of chronic diseases globally and locally, identification of risk factors, prevention strategies)
- 3. Methodology of health promotion and health education** (Community health promotion, individual level health promotion, design of education strategies and programs)
- 4. The relationship between mental health and psychosocial health** (The impact of stress on health, psychosocial factors and their role in the development of illness, treatment of mental illness)
- 5. Health systems and their efficiency in different countries** (Financing of health systems, accessibility and quality of health care in different countries)
- 6. The role of lifestyle in maintaining health** (The impact of diet, physical activity, sleep and other lifestyle factors on health)
- 7. Principles and current challenges of epidemiology and public health** (Prevention and control of infectious diseases, strategies of epidemiology, lessons learned from COVID-19)
- 8. Strategies to address and reduce health inequalities** (The relationship between socio-economic status and health status, equal access to health care, discrimination in health care)
- 9. Research methodology in health sciences** (Design, conduct, data collection and analysis of clinical and social science studies)
- 10. Ethical questions of research in health sciences:** Discuss ethical issues in research and how to address them (ethical issues, ethical approvals and good practices)

- 11. Using quantitative research methods. Statistical analysis and data management:** describe the most commonly used statistical analysis techniques (e.g. analysis of variance, regression) and data management methods in health research
- 12. Using qualitative research methods in health sciences:** Discuss the role and benefits of qualitative research methods (e.g. interviews, focus groups)
- 13. Publication strategies in health sciences:** Explain the importance of effective publication strategies, including the selection of targeted journals, the peer-review process, and dissemination of research results
- 14. Communicating and using research results:** Talk about how to effectively communicate research results to different target groups (e.g. scientific audience, policy makers, public) and about best practices in scientific communication.
- 15. The role of digital technologies in health sciences and healthcare** (Telemedicine, mHealth applications, management and use of digital health data in healthcare)