PHYSIOLOGY AND PATHOPHYSIOLOGY III
(25 pages)
Faculty of Medicine in Rijeka
Course: Physiology and Pathophysiology III
Course Coordinator: Zlatko Trobonjača, MD, PhD, Full Professor
Department: Department of Physiology, Immunology, and Pathophysiology
Study: Integrated Undergraduate and Graduate University Study of Medicine in English
Year of the study: Third
Academic year: 2020/2021

COURSE SYLLABUS

Course information (basic description, general information, teaching overview, required equipment, and preparation, etc.):

The basic aim of this course is to enable the students to acquire knowledge about the physiological mechanisms of the gastrointestinal and hepatobiliary system, the metabolism and regulation of body temperature, and the morphological and functional structure of the endocrine system. Also, the aim of this course is to enable the students to acquire knowledge about the pathophysiological mechanisms and impaired functioning of the gastrointestinal and hepatobiliary system, basic and specific metabolic disorders and endocrinopathies. Encouraging horizontal and vertical integration of knowledge on natural courses of physiological and etiopathogenetic processes will contribute to the understanding of the specificity of the etiological factor activity, i.e. the mechanism of origin, course, and local and systemic consequences of different diseased states.

The course is performed in the winter semester at the third year of study, in the form of lectures (34 teaching hours), seminars (45 teaching hours), and practicals (25 teaching hours), which totals 10 ECTS credits. A) Lectures are a form of classes that provide an introduction and an overview of a thematic unit that is taught in more detail on seminars and practicals. B) Seminars and C) practicals are a form of classes where students actively review and critically discuss physiological and pathophysiological mechanisms (of certain morphological and functional units), which are then explained at the molecular, microenvironmental, organic, systemic and whole-organism level. Active participation of students in the curriculum program is further achieved by D) studying natural integrators of etiopathogenetic events, the so-called etiopathogenetic clusters, E) performing practicals in the laboratory and on computer programs that simulate pathological conditions and provide clinical correlates of certain diseases, and F) performing presentations of certain teaching unit content (PowerPoint presentations).

Class attendance and student participation in all forms of classes are compulsory in accordance with the Law and the Statute of the Faculty of Medicine in Rijeka. Accordingly, student attendance at lectures, seminars, and practicals will be regularly checked. Only justifiable absences due to, for example, illness will be acceptable within the limits allowed and according to the Ordinance on Studies.

The student is obligated to prepare in advance the predefined material that is being discussed on seminars and practicals. The teacher/course coordinator continuously evaluates student participation throughout seminars and practicals (demonstrated knowledge, the ability to correlate morphological, ultrastructural, biochemical and/or functional factors into a complete image of physiological functional systems and certain diseased states). Student activity during classes (lectures, seminars, practicals) is certified in the daily work log.
Lectures, seminars, and practicals take place according to the Syllabus. Schedule of students by groups can be found on the SharePoint platform of the Department of Physiology and Immunology at the following website: https://spp.uniri.hr/ss_medri/katedre/427 - accessed via an AAI address.

Required reading:
4. Rukavina, D., Radošević Stašić, B., Lučin, P., Ćuk, M. Handbook for Practicals in Physiology, Neurophysiology, and Immunology, Department of Physiology, Immunology, and Pathological Physiology, Faculty of Medicine in Rijeka, October 2001.

Recommended for additional reading:

Course teaching plan:
List of lectures (with titles and learning outcomes):

Lecture 1. Gastrointestinal physiology: part I
Learning outcomes:
To describe the general principles of the gastrointestinal wall structure.
To describe the electrical activity of the gastrointestinal smooth muscle.
To explain the blood circulation of the digestive system.
To describe the functional movements of the digestive system.
To describe the neural control of gastrointestinal functions (intestinal nervous system).
To explain food intake, chewing, and swallowing.
To describe the functions of the stomach, the movements of the small and large intestine.

Lecture 2. Gastrointestinal physiology: part II
Learning outcomes:
To define general and locally specific principles of secretion in the digestive system.
To explain digestion and absorption of various nutrients (carbohydrates, proteins, fats) in certain segments of the digestive system.

Lecture 3. Pathophysiology of gastrointestinal system
Learning outcomes:
To describe the disorders of the throat, esophagus, and stomach.
To explain the disorders of the exocrine pancreatic function.
To describe the disorders of the small and large intestine.
To explain the pathophysiological forms and consequences of diarrhea.
To explain the mechanism and consequences of vomiting.
To describe the causes and consequences of ileus.

Lecture 4. Metabolism of proteins and carbohydrates
Learning outcomes:
To describe the physiology of protein metabolism.
To explain the etiological factors, mechanisms, and consequences of impaired protein metabolism.
To explain the causes and consequences of protein deficiency.
To explain the mechanisms and effects of primary and secondary malnutrition.
To explain the physiology of carbohydrate metabolism and adenosine triphosphate formation.
To explain the etiological mechanisms and consequences of impaired carbohydrate metabolism.
To describe the causes and effects of hyperglycemia.
To describe the causes and effects of hypoglycemia.
To explain the disorders of glycogen metabolism.

Lecture 5. Lipid metabolism

Learning outcomes:
To describe the physiology of lipid metabolism.
To describe the causes, mechanisms, and pathophysiological effects of lipoprotein disorders (primary and secondary hyperlipoproteinemia, other disorders of lipoprotein metabolism).
To describe the causes, mechanisms, and pathophysiological effects of lipid deposition disorders (lipidosis, atherosclerosis, and obesity).

Lecture 6. Liver physiology

Learning outcomes:
To explain the macromorphological and micromorphological structure of the liver.
To describe the basic function unit – hepatic lobule.
To explain blood flow through the liver and the hepatic macrophage system.
To describe the system of lymph glands in the liver.
To describe the liver metabolism of carbohydrates, amino acids, and ammonia.
To explain the synthesis and degradation of proteins in the liver (glycoproteins, angiotensinogen, coagulation factors, hematopoietic factors, acute phase proteins).
To describe the detoxification mechanisms (drugs, toxic substances).
To describe the alcohol metabolism.
To explain the hormone metabolism.
To describe the metabolism of lipids (fatty acids and triglycerides) and cholesterol.
To explain the bilirubin metabolism.
To describe the biliary tree and the creation, excretion, and role of bile in the digestion and absorption of fat.
To describe the iron and vitamin storage in the liver.

Lecture 7. Disorders of hepatobiliary system: part I

Learning outcomes:
To explain the etiopathogenesis of metabolic and infiltrative liver diseases (metabolic disorders of bilirubin, jaundice, fatty liver).
To understand the etiopathogenesis of viral hepatitis (A, B, C, D, E) and autoimmune hepatitis.
To define toxic and medicated damage to the liver.
To explain the pathogenesis of alcoholic liver disease.

Lecture 8. Disorders of hepatobiliary system: part II

Learning outcomes:
To describe the pathogenesis of alcoholic, posthepatic, primary biliary, secondary biliary, and cardiac liver cirrhosis.
To understand the development of complications of liver cirrhosis (portal hypertension, ascites, spontaneous bacterial peritonitis, hepatic encephalopathy, hepatorenal syndrome, hepatopulmonary syndrome, hypersplenism, coagulopathy).
To describe diseases of the biliary system (gallstones, cholangitis).

Lecture 9. Disorders of exocrine pancreas function – acute and chronic pancreatitis

Learning outcomes:
To describe the physiological structure of the exocrine part of the pancreas.
To describe water and electrolyte secretion.
To explain formation and secretion of pancreatic digestive enzymes.
To describe control over pancreatic secretion.
To describe cystic fibrosis of the pancreas.
To explain the etiopathogenic factors, course, and complications of (local, systemic) acute pancreatitis.
To explain the etiopathogenic factors, course, and complications of chronic pancreatitis.

Lecture 10. Introduction to endocrinology, Pituitary hormones
Learning outcomes:
To explain the structure of the endocrine system and the mechanisms of hormone activity.
To explain the mechanisms of adeno and neuro pituitary hormone production and function and their hypothalamic control.
To understand the causes and consequences of increased and decreased hormone secretion.
To understand the causes and consequences of disorders in the target tissue of the hormone.
To explain the disorders of hormone metabolism and regulation of hormonal systems.
To explain the pituitary function disorders.

Lecture 11. Thyroid Metabolic hormones
Learning outcomes:
To explain the production, secretion, and physiological functions of thyroid metabolic hormones.
To understand thyroid function disorders: thyrotoxicosis, hyperthyroidism, hypothyroidism, and goiter.

Lecture 12. Adrenocortical hormones
Learning outcomes:
To explain the production, secretion, and physiological functions of adrenal cortex hormones.
To understand the causes, course, and consequences of hyperfunction and hypofunction of the adrenal cortex.
To understand the disorders of the adrenal gland core.

Lecture 13. Parathyroid Hormone, calcitonin, calcium and phosphate metabolism
Learning outcomes:
To explain the production, secretion, and action of parathyroid hormone and calcitonin.
To explain the mechanisms for maintaining calcium and phosphate metabolism.
To explain calcium, phosphate, and magnesium turnover disorders.
To explain disorders with increased or decreased parathyroid hormone formation.
To explain disorders with increased or decreased calcitonin formation.

Lecture 14. Insulin, glucagon, and diabetes mellitus
Learning outcomes:
To understand the mechanisms of production, secretion, and metabolic effects of insulin, glucagon, and somatostatin.
To explain the causes and consequences of impaired insulin, glucagon, and somatostatin action.
To understand the etiopathogenesis of various types of diabetes.
To explain the course and acute and chronic consequences of diabetes.

Lecture 15. Predictors and clinical implications of metabolic syndrome
Learning outcomes:
To define the components of the metabolic syndrome.
To describe the inherited and acquired etiopathogenetic factors of the metabolic syndrome.
To define the role of obesity (adipokine production and release of nonesterified fatty acids from adipose tissue and their action and ectopic accumulation in muscle tissue, liver, and pancreas) in the development of the metabolic syndrome.
To describe the release of PAI-1, TNF, IL-6, and resistin, the role in the progression of the metabolic syndrome.
To define the role of insulin resistance in the metabolic syndrome.
To describe the mechanisms and the role of atherogenic dyslipidemia, hypertension, hyperglycemia, prothrombotic, and failure status in the development of cardiovascular diseases.

Lecture 16. Reproductive functions and sex hormones
Learning outcomes:
To describe the functional structure of male genitalia.
To describe the spermatogenesis and the male sexual act.
To understand the chemical structure, secretion, metabolism, and effects of male sex hormones.
To describe the disorders of male sexual functions.
To understand the functional anatomy of female genitalia.
To describe the female sex hormone system.
To describe the monthly ovarian cycle and the function of gonadotrophic hormone.
To clarify the ovarian hormone functions, estradiol and progesterone.
To describe the interaction of ovarian and hypothalamic-pituitary hormones.
To explain the female sexual act.
To describe pregnancy, lactation, and the physiology of the fetus and newborn.

Lecture 17. Integral organismic reactions to noxious stimuli

**Learning outcomes:**
To describe the strategy of the systemic pathobiological response of the organism under noxious stimuli.
To explain stress – spontaneous systematic directing of reactivity.
To describe acute-phase response during an inflammatory process.
To understand systemic inflammatory response and multiple organ failure.
To describe the immunological patterns of systemic response.
To understand healing and fibrosis processes and changes in tissue architecture (remodeling).

**List of seminars (with titles and learning outcomes):**

**Seminar 1. Gastrointestinal physiology**

**Learning outcomes:**
To explain the general principles of the gastrointestinal wall structure, blood circulation, and digestive tract mobility.
To describe the neural control of gastrointestinal functions.
To explain functional movements, suppression, and mixing of food in the digestive system.
To define general and locally specific principles of secretion in the digestive system.
To explain the digestion and absorption of different nutrients (carbohydrates, proteins, fats) in particular segments of the digestive system.

**Seminar 2. Pathophysiology of gastrointestinal system**

**Learning outcomes:**
To explain the functional disorders of the pharynx, esophagus, stomach, exocrine part of the pancreas, small and large intestine.
To explain the pathophysiological forms of diarrhea and the vomiting mechanism.
To understand the causes and consequences of ileus.

**Seminar 3. Metabolism of proteins and carbohydrates**

**Learning outcomes:**
To explain the physiology of carbohydrate metabolism and adenosine triphosphate formation.
To explain the etiological mechanisms and consequences of impaired carbohydrate metabolism.
To understand the causes and effects of hyperglycemia.
To understand the causes and effects of hypoglycemia.
To explain the disorders of glycogen metabolism.
To understand the physiology of protein metabolism.
To explain the etiological mechanisms and consequences of impaired protein metabolism.
To understand the causes and consequences of protein deficiency.
To explain the mechanisms and effects of primary and secondary malnutrition.

**Seminar 4. Lipid metabolism**

**Learning outcomes:**
To understand the physiology of lipid metabolism.
To describe the causes, mechanisms, and pathophysiological effects of lipoprotein disorders.
To describe the causes, mechanisms, and pathophysiological effects of lipid deposition disorders.
Seminar 5. Dietary Balances, regulation of feeding, metabolism, body temperature regulation

**Learning outcomes:**
To understand the mechanisms and importance of maintaining a balanced diet and regulating food intake (obesity and fasting).
To describe the energetics and intensity of metabolism.
To explain the mechanisms of maintaining normal body temperature.
To describe the organism's response to environmental temperature changes.
To explain the pathogenetic causes, course, and consequences of hyperthermia and hypothermia.

Seminar 6. Metabolism of specific metabolic substances

**Learning outcomes:**
To explain the metabolism and mechanisms of action of vitamins and minerals.
To explain the etiopathogenesis of turnover disorders of specific metabolic substances.
To understand vitamin change disorders (hypovitaminosis, hypervitaminosis).
To understand the disorders in changes of elements in traces.

Seminar 7. General endocrinology, pituitary gland

**Learning outcomes:**
To explain the structure of the endocrine system and the mechanisms of hormone action.
To explain the mechanisms of adeno and neuro pituitary hormone production and action and their hypothalamic control.
To understand the causes and consequences of increased and decreased hormone secretion.
To understand the causes and consequences of disorders in the target hormone tissue.
To explain disorders of hormone metabolism and regulation of hormone systems.
To explain impaired function of the anterior and posterior pituitary lobe.

Seminar 8. Thyroid and adrenal gland

**Learning outcomes:**
To explain the production, secretion, and physiological functions of thyroid metabolic hormones.
To understand thyroid function disorders: thyrotoxicosis, hyperthyroidism, hypothyroidism, asphyxiation.
To explain the production, secretion, and physiological functions of adrenal cortex hormones.
To understand the causes, course, and consequences of hyperfunction and hypofunction of the adrenal cortex.
To understand the disorders of the adrenal gland core.

Seminar 9. Parathyroid glands

**Learning outcomes:**
To explain the production, secretion, and action of parathyroid hormone and calcitonin.
To understand the mechanisms of maintaining calcium and phosphate metabolism.
To explain the disorders of calcium, phosphate, and magnesium turnover.
To explain the disorders with increased and decreased parathyroid hormone production.
To explain the disorders with increased and decreased calcitonin formation.

Seminar 10. Endocrine pancreas, diabetes mellitus

**Learning outcomes:**
To understand the mechanisms of production, secretion, and metabolic effects of insulin, glucagon, and somatostatin.
To explain the causes and consequences of impaired insulin, glucagon, and somatostatin action.
To understand the etiopathogenesis, course, and acute and chronic consequences of diabetes.

Seminar 11. Reproductive functions and sex hormones

**Learning outcomes:**
To explain the formation, secretion, and action of male and female sex hormones.
To understand biofeedback mechanisms in the regulation and function of sex hormones.
To explain hormonal effects in pregnancy.
List of practicals (with titles and learning outcomes):

<table>
<thead>
<tr>
<th>Practical 1: Gastrointestinal system and metabolism</th>
<th>Learning outcomes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Theoretical part:</td>
<td>To understand the material discussed on lectures (content of the L 1., L 2., L 3., L 4.) and seminars (content of the S 1., S 2., S 3., S 4., S 5., S 6.). This material covers the fields of physiology and pathophysiology of the digestive system, normal and impaired metabolism of proteins, carbohydrates, and lipids, as well as the fields of nutrition, energetics, metabolism intensity and thermoregulation.</td>
</tr>
<tr>
<td>II. Practical part:</td>
<td>To describe the performance and to understand the effects of vagus stimulation and histamine injection on gastric secretion.</td>
</tr>
<tr>
<td>To solve the study guide algorithms of the digestive system and metabolism.</td>
<td></td>
</tr>
<tr>
<td>Problem 22. Molecular-cellular pathogenesis of familial hypercholesterolemia (str.103 –106)</td>
<td></td>
</tr>
<tr>
<td>Problem 2. Etiopathogenesis of cystic fibrosis (str.5 – 8).</td>
<td></td>
</tr>
<tr>
<td>Problem 117. Pathophysiology of gluten sensitive enteropathy (str. 530-533).</td>
<td></td>
</tr>
<tr>
<td>Problem 118. Pathogenesis of diarrhea in the cholera syndrome (str. 534-537).</td>
<td></td>
</tr>
<tr>
<td>Problem 119. Pathophysiology of peptic disease in the course of gastrinoma (Zollinger- Ellison syndrome) (str. 538-541)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical 2: Liver physiology and pathophysiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning outcomes:</td>
</tr>
<tr>
<td>I. Theoretical part:</td>
</tr>
<tr>
<td>II. Practical part:</td>
</tr>
<tr>
<td>To solve the study guide algorithms of liver physiology and pathophysiology:</td>
</tr>
<tr>
<td>Problem 124. Pathophysiology of the obstructive icterus caused by cholelithiasis (str. 561-564).</td>
</tr>
</tbody>
</table>

| Practical 3: Sports Physiology |
| Learning outcomes: |
| I. Theoretical part:                             | To understand the effect of low oxygen pressure on the body. |
| To explain physiological problems in deep-sea diving and other hyperbaric conditions. |
| To describe the sports physiology. |
| II. Practical part:                              | To explain the performance of biofeedback tests. |
| To describe the performance and significance of the physiology of aerobic exercises. |
| To solve the etiopathogenetic clusters of liver physiology and pathophysiology: |
Practical 4: Endocrinology

Learning outcomes:
I. Theoretical part:
To understand the material discussed on lectures (content of the L 9., L 10., L 11., L 12., L 13., L 14.) and seminars (content of the S 7., S 8., S 9., S 10.). This material covers the fields of physiology and pathophysiology of general endocrinology, pituitary hormones, thyroid metabolic hormones, adrenal cortex hormones, parathyroid hormone, calcitonin, calcium and phosphate metabolism, and insulin, glucagon, and diabetes.
II. Practical part:
To explain the performance and effect of thyroid hormone on oxygen consumption.
To explain the performance and effect of inducing hypocalcemic tetany in rats.
To explain the performance and significance of Thorn's test in rats.
To explain the performance and effects of insulin hypoglycemia in rats.
To explain the performance and significance of the glucose tolerance test.
To solve the study guide algorhythms of the endocrine system.
Problem 36. Pathophysiology of hyperfunctioning thyroid adenoma caused by a point mutation in the thyrotropin receptor (str. 168 – 172).
Problem 38. Pathophysiology of hyperosmolal syndrome in the course of newly diagnosed diabetes mellitus (str. 178 – 182)
Problem 20. Pathogenesis of diabetes mellitus related chronic complications (str. 93 – 97)
Problem 39. Pathogenesis of primary aldosteronism (Conn’s syndrome) (str. 183 – 186)
Problem 40. Pathophysiology of Cushing’s disease (str. 187 – 190)

Practical 5: Reproduction

Learning outcomes:
I. Theoretical part:
To understand the material discussed on lectures (content of the L 15.). This material covers the field of physiology and pathophysiology of reproductive functions and sex hormones.
To describe the reproductive and hormonal functions in men.
To explain the action of the epiphysis.
To understand the physiology of women before pregnancy and the effects of female sex hormones.
To describe pregnancy and lactation.
To explain the physiology of the fetus and newborn.
II. Practical part:
To describe the performance and significance of demonstrating chorionic gonadotropin in the urine of pregnant women with the Ascheim–Zondek test.
To explain the performance and significance of the effect of sex hormones on cytological findings of the vaginal smear in female rats.
To solve the study guide algorhythms of reproduction.

WARNING: students are obligated to bring the following items on practical classes: a) lab coat and b) Handbook for Practicals in Physiology, Neurophysiology, and Immunology, which is available in the electronic form on the Department’s website (can be downloaded from the SharePoint platform of the Department of Physiology).

Student obligations:

Students are obligated to regularly attend and actively participate in all forms of classes. The student should be prepared for seminar and practical classes and familiarize with the material from the syllabus for each seminar and practical.
Exam (exam taking, detailed exam description of the oral/written/practical part, point distribution, grading criteria):

**ECTS grading system:**

Student work will be evaluated during classes and at the final exam. A maximum of **70 grade points** can be obtained during classes and up to **30 grade points** at the final exam, which totals **100 grade points**.

I. The following components are evaluated during classes (up to 70 grade points):

a) acquired knowledge (up to 56 grade points)
b) participation in classes (up to 10 grade points)
c) class attendance (up to 4 grade points)

a) acquired knowledge (up to 56 grade points)

During classes, acquired knowledge will be evaluated by means of two tests comprising 50 questions. The first test will be held after teaching the following content: physiology and pathophysiology of metabolism, digestive and hepatobiliary systems. The second test will be held after teaching the following content: physiology and pathophysiology of the endocrine system. A student may obtain up to 28 grade points on each test as follows:

<table>
<thead>
<tr>
<th>Correct answers</th>
<th>Grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>48,49,50</td>
<td>28</td>
</tr>
<tr>
<td>46,47</td>
<td>27</td>
</tr>
<tr>
<td>44,45</td>
<td>26</td>
</tr>
<tr>
<td>42,43</td>
<td>25</td>
</tr>
<tr>
<td>40,41</td>
<td>24</td>
</tr>
<tr>
<td>38,39</td>
<td>23</td>
</tr>
<tr>
<td>36,37</td>
<td>22</td>
</tr>
<tr>
<td>34,35</td>
<td>21</td>
</tr>
<tr>
<td>32,33</td>
<td>20</td>
</tr>
<tr>
<td>30,31</td>
<td>19</td>
</tr>
<tr>
<td>28,29</td>
<td>18</td>
</tr>
<tr>
<td>25,26,27</td>
<td>17</td>
</tr>
</tbody>
</table>

A student can access the correction of the first and second midterm exam if they did not obtain a minimum criteria the first time, in case of absence at the midterm exam the first time, or if they are not satisfied with the obtained credits at the exam the first time. If a student retakes the midterm exam because they are not satisfied with the obtained grade points, only the credits obtained at the retaken midterm exam will be considered. Correction of midterm exams will take place between two exam terms in February 2020.

b) participation in classes (up to 10 grade points)

Based on oral discussions and/or written tests, student knowledge is graded at all seminar classes. A student can obtain grade points during classes only if they were graded at least 9 times out of a total of 11 possible seminars. The obtained average grade is converted into grade points as shown in the table:

<table>
<thead>
<tr>
<th>Average grade</th>
<th>Grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.26 – 5.0</td>
<td>10</td>
</tr>
<tr>
<td>3.76 – 4.25</td>
<td>8</td>
</tr>
<tr>
<td>3.26 – 3.75</td>
<td>6</td>
</tr>
<tr>
<td>2.76 – 3.25</td>
<td>4</td>
</tr>
<tr>
<td>2.00 – 2.75</td>
<td>3</td>
</tr>
</tbody>
</table>
c) class attendance (up to 4 grade points)
By attending all forms of classes (lectures, seminars, practicals), students can obtain grade points in the following way:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>4 grade points</td>
</tr>
<tr>
<td>90%-99%</td>
<td>3 grade points</td>
</tr>
<tr>
<td>80%-89%</td>
<td>2 grade points</td>
</tr>
<tr>
<td>70%-79%</td>
<td>1 grade point</td>
</tr>
</tbody>
</table>

II. Final exam (up to 30 grade points)
The final exam consists of an oral and a written part. A student must solve at least 50% of the test in order to access the oral part of the final exam. The written and the oral part of the final exam comprise a sum, and the final grade corresponds to the total number of grade points as shown in the table:

<table>
<thead>
<tr>
<th>Total number of grade points</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 – 17</td>
<td>sufficient (2)</td>
</tr>
<tr>
<td>18 - 22</td>
<td>good (3)</td>
</tr>
<tr>
<td>23 – 26</td>
<td>very good (4)</td>
</tr>
<tr>
<td>27 - 30</td>
<td>excellent (5)</td>
</tr>
</tbody>
</table>

Out of the total number of grade points obtained at the written part of the final exam, the student can obtain a maximum of 25 grade points, and a minimum of 13 grade points as shown in the table:

<table>
<thead>
<tr>
<th>Correct answers</th>
<th>Number of grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>78,79,80</td>
<td>25</td>
</tr>
<tr>
<td>75,76,77</td>
<td>24</td>
</tr>
<tr>
<td>72,73,74</td>
<td>23</td>
</tr>
<tr>
<td>68,69,70,71</td>
<td>22</td>
</tr>
<tr>
<td>64,65,66,67</td>
<td>21</td>
</tr>
<tr>
<td>60,61,62,63</td>
<td>20</td>
</tr>
<tr>
<td>57,58,59</td>
<td>19</td>
</tr>
<tr>
<td>54,55,56</td>
<td>18</td>
</tr>
<tr>
<td>51,52,53</td>
<td>17</td>
</tr>
<tr>
<td>48,49,50</td>
<td>16</td>
</tr>
<tr>
<td>46,47</td>
<td>15</td>
</tr>
<tr>
<td>43,44,45</td>
<td>14</td>
</tr>
<tr>
<td>40,41,42</td>
<td>13</td>
</tr>
</tbody>
</table>
A student can access the oral part of the final exam only if they obtained a minimum of 13 grade points (at least 50% of the test) at the written part of the final exam. A student can obtain grade points at the oral part of the exam as shown in the table:

<table>
<thead>
<tr>
<th>Grade obtained at the oral part of the final exam</th>
<th>Number of grade points obtained at the oral part of the final exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>excellent (5)</td>
<td>5</td>
</tr>
<tr>
<td>very good (4)</td>
<td>4</td>
</tr>
<tr>
<td>good (3)</td>
<td>3</td>
</tr>
<tr>
<td>sufficient (2)</td>
<td>2</td>
</tr>
<tr>
<td>insufficient (1)</td>
<td>0</td>
</tr>
</tbody>
</table>

Who can access the final exam:

Students who obtained 35-70 grade points during classes are obligated to access the final multiple-choice questions (MCQ) test, where they can obtain additional grade points.

- Students who obtained less than 35 grade points during classes or were absent for more than 30% of classes are not allowed to access the final exam.

III. The final grade represents the sum of all grade points obtained during classes and at the final exam. It is based on the absolute redistribution according to the following scale:

<table>
<thead>
<tr>
<th>Grade obtained</th>
<th>Number of grade points obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (90-100%)</td>
<td>excellent (5)</td>
</tr>
<tr>
<td>B (75-89,9%)</td>
<td>very good (4)</td>
</tr>
<tr>
<td>C (60-74,9%)</td>
<td>good (3)</td>
</tr>
<tr>
<td>D (50-59,9%)</td>
<td>sufficient (2)</td>
</tr>
<tr>
<td>(student who has solved less than 50% of the test at the final exam)</td>
<td>insufficient (1)</td>
</tr>
<tr>
<td>Date</td>
<td>Lectures (time and place)</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>01/10/2020</td>
<td>L1 (10.15 – 12.00) Lecture room 8 On-line</td>
</tr>
<tr>
<td>01/10/2020</td>
<td>L2 (12.15 – 14.00) Lecture room 8 On-line</td>
</tr>
<tr>
<td>05/10/2020</td>
<td>L3 (10.15 – 12.00) Lecture room 15 On-line</td>
</tr>
<tr>
<td>08/10/2020</td>
<td></td>
</tr>
<tr>
<td>08/10/2020</td>
<td></td>
</tr>
<tr>
<td>13/10/2020</td>
<td>L4 (8.15 – 10.00) Lecture room 1 On-line</td>
</tr>
<tr>
<td>15/10/2020</td>
<td></td>
</tr>
<tr>
<td>15/10/2020</td>
<td></td>
</tr>
<tr>
<td>20/10/2020</td>
<td>L5 (08.15 – 10.00) Lecture room 1 On-line</td>
</tr>
<tr>
<td>22/10/2020</td>
<td></td>
</tr>
<tr>
<td>22/10/2020</td>
<td></td>
</tr>
<tr>
<td>26/10/2020</td>
<td>L6 (9.15 – 11.00) Lecture room 8 On-line</td>
</tr>
<tr>
<td>27/10/2020</td>
<td>L7 (8.15 – 10.00) Lecture room 1 On-line</td>
</tr>
<tr>
<td>29/10/2020</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Code</td>
</tr>
<tr>
<td>------------</td>
<td>-------</td>
</tr>
<tr>
<td>29/10/2020</td>
<td>S4A</td>
</tr>
<tr>
<td>03/11/2020</td>
<td>L8</td>
</tr>
<tr>
<td>05/11/2020</td>
<td>S5B</td>
</tr>
<tr>
<td>05/11/2020</td>
<td>S5A</td>
</tr>
<tr>
<td>06/11/2020</td>
<td>P1A</td>
</tr>
<tr>
<td></td>
<td>P1C</td>
</tr>
<tr>
<td></td>
<td>P1D</td>
</tr>
<tr>
<td>09/11/2020</td>
<td>P2A</td>
</tr>
<tr>
<td></td>
<td>P2C</td>
</tr>
<tr>
<td></td>
<td>P2D</td>
</tr>
<tr>
<td>12/11/2020</td>
<td>S6B</td>
</tr>
<tr>
<td>12/11/2020</td>
<td>S6A</td>
</tr>
<tr>
<td>13/11/2020</td>
<td>P3A</td>
</tr>
<tr>
<td></td>
<td>P3C</td>
</tr>
<tr>
<td></td>
<td>P3D</td>
</tr>
<tr>
<td>17/11/2020</td>
<td>L9</td>
</tr>
<tr>
<td>19/11/2020</td>
<td>S7B</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 19/11/2020 | S7A (12.00-15.00)  
Lecture room 9  
**On-line** | B. Ćurko-Cofek, MD, PhD, Postdoctoral Research Assistant |
| 20/11/2020 | **Midterm exam I**  
**On-line** |                                |
| 23/11/2020 | L11 (12.15 – 14.00)  
Lecture room 15  
**On-line** | V. Barac-Latas, MD, PhD, Full Professor |
<table>
<thead>
<tr>
<th>Date</th>
<th>Room</th>
<th>Time</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>24/11/2020</td>
<td>L12</td>
<td>(08.15 – 10.00)</td>
<td>Lecture room 1 On-line</td>
<td>H. Jakovac, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>26/11/2020</td>
<td>S8B</td>
<td>(9.00-12.00)</td>
<td>Seminar room - Dept. of Physiol. and Immunol. On-line</td>
<td>Z. Trobonjača, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>26/11/2020</td>
<td>S8A</td>
<td>(12.00-15.00)</td>
<td>Seminar room - Dept. of Physiol. and Immunol. On-line</td>
<td>H. Jakovac, MD, PhD, Full Professor</td>
</tr>
<tr>
<td></td>
<td>P3B</td>
<td>(08.15-12.00)</td>
<td>Practical room - Dept. of Physiol. and Immunol.</td>
<td>H. Mahmutefendić-Lučić, PhD, Associate Professor</td>
</tr>
<tr>
<td>30/11/2020</td>
<td>P3C</td>
<td>(08.15-12.00)</td>
<td>Practical room - Dept. of Physiol. and Immunol. On-line</td>
<td>I. Mrakovčić Šutić, MD, PhD, Full Professor</td>
</tr>
<tr>
<td></td>
<td>P3D</td>
<td>(09.15-13.00)</td>
<td>Practical room - Dept. of Physiol. and Immunol.</td>
<td>H. Mahmutefendić-Lučić, PhD, Associate Professor</td>
</tr>
<tr>
<td>01/12/2020</td>
<td>L13</td>
<td>(08.15 – 10.00)</td>
<td>Lecture room 1 On-line</td>
<td>G. Blagojević Zagorac, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>03/12/2020</td>
<td>S9B</td>
<td>(9.00-12.00)</td>
<td>Lecture room 15 On-line</td>
<td>Z. Trobonjača, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>03/12/2020</td>
<td>S9A</td>
<td>(12.00-15.00)</td>
<td>Lecture room 15 On-line</td>
<td>G. Blagojević Zagorac, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>07/12/2020</td>
<td>L14</td>
<td>(12.15 – 14.00)</td>
<td>Lecture room 8 On-line</td>
<td>V. Barac-Latas, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>07/12/2020</td>
<td>L15</td>
<td>(14.15 – 16.00)</td>
<td>Lecture room 8 On-line</td>
<td>I. Mrakovčić Šutić, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>10/12/2020</td>
<td>S10B</td>
<td>(8.00-11.00)</td>
<td>Lecture room 9 On-line</td>
<td>Silvija Lukanović Jurić, dr. med., Assistant</td>
</tr>
<tr>
<td>10/12/2020</td>
<td>S10A</td>
<td>(12.00-15.00)</td>
<td>Lecture room 5 On-line</td>
<td>I. Mrakovčić Šutić, MD, PhD, Full Professor</td>
</tr>
<tr>
<td>10/12/2020</td>
<td>P4A</td>
<td>(16.15-20.00)</td>
<td>Practical room - Dept. of Physiol. and Immunol. On-line</td>
<td>B. Ćurko-Cofek, MD, PhD, Postdoctoral Research Assistant</td>
</tr>
<tr>
<td></td>
<td>P4B</td>
<td>(15.15-19.00)</td>
<td>Practical room - Dept. of Physiol. and Immunol.</td>
<td>H. Mahmutefendić-Lučić, PhD, Associate Professor</td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Time</td>
<td>Instructor</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>14/12/2020</td>
<td>P4C (08.15-12.00)</td>
<td>P5D (09.15-13.00) Practical room - Dept. of Physiol. and Immunol.</td>
<td>H. Mahmutefendić-Lučin, PhD, Associate Professor</td>
<td></td>
</tr>
<tr>
<td>15/12/2020</td>
<td>Lecture room 1</td>
<td>L16 (08.15-10.00) On-line</td>
<td>G. Laškarin, MD, PhD, Full Professor</td>
<td></td>
</tr>
</tbody>
</table>
List of lectures, seminars, and practicals:

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Time</th>
<th>Place</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/12/2020</td>
<td>S11B (8.00–11.00) Lecture room 5 On-line</td>
<td>Silvija Lukanović Jurić, dr. med., Assistant</td>
<td></td>
</tr>
<tr>
<td>17/12/2020</td>
<td>S11A (12.00–15.00) Lecture room 8 On-line</td>
<td>Ingrid Šutić, dr. med., Assistant</td>
<td></td>
</tr>
<tr>
<td>18/12/2020</td>
<td>P5A (09.15-13.00) P5B (09.15-12.00) Practical room - Dept. of Physiol. and Immunol.</td>
<td>G. Laškarin, MD, PhD, Full Professor H. Mahmutefendić-Lučin, PhD, Associate Professor</td>
<td></td>
</tr>
<tr>
<td>21/12/2020</td>
<td>P5C (08.15-12.00) P5D (09.15-13.00) Practical room - Dept. of Physiol. and Immunol.</td>
<td>V. Pavišić, MD, Teaching Assistant H. Mahmutefendić-Lučin, PhD, Associate Professor</td>
<td></td>
</tr>
<tr>
<td>08/1/2021</td>
<td>L17 (11.15-13.00) On-line</td>
<td>H. Jakovac, MD, PhD, Full Professor</td>
<td></td>
</tr>
<tr>
<td>25/1/2021</td>
<td>Midterm exam II On-line</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

List of lectures, seminars, and practicals:

<table>
<thead>
<tr>
<th>LECTURES (topics)</th>
<th>Teaching hours</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Gastrointestinal physiology: part I</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L2 Gastrointestinal physiology: part II</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L3 Pathophysiology of gastrointestinal system</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L4 Metabolism of proteins and carbohydrates</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L5 Lipid metabolism</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L6 Liver physiology</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L7 Disorders of hepatobiliary system: part I</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L8 Disorders of hepatobiliary system: part II</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L9 Disorders of exocrine pancreas function – acute and chronic pancreatitis</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L10 Introduction to endocrinology, Pituitary hormones</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L11 Thyroid Metabolic hormones</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L12 Adrenocortical hormones</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L13 Parathyroid Hormone, calcitonin, calcium and phosphate metabolism</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L14 Insulin, glucagon, and diabetes mellitus</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L15 Predictors and clinical implications of metabolic syndrome</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L16 Reproductive functions and sex hormones</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td>L17 Integral organismic reactions to noxious stimuli</td>
<td>2</td>
<td>Lecture Hall 2</td>
</tr>
<tr>
<td><strong>Total number of lecture hours</strong></td>
<td><strong>34</strong></td>
<td></td>
</tr>
</tbody>
</table>
### SEMINARS (topics)

<table>
<thead>
<tr>
<th>Term</th>
<th>Teaching hours</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S2</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S3</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S4</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S5</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S6</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S7</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S8</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S9</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S10</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
<tr>
<td>S11</td>
<td>4</td>
<td>Seminar room, Lecture Hall 5</td>
</tr>
</tbody>
</table>

**Total number of seminar hours** 45

### PRACTICALS (topics)

<table>
<thead>
<tr>
<th>Term</th>
<th>Teaching hours</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5</td>
<td>Practical Room</td>
</tr>
<tr>
<td>P2</td>
<td>5</td>
<td>Practical Room</td>
</tr>
<tr>
<td>P3</td>
<td>5</td>
<td>Practical Room</td>
</tr>
<tr>
<td>P4</td>
<td>5</td>
<td>Practical Room</td>
</tr>
<tr>
<td>P5</td>
<td>5</td>
<td>Practical Room</td>
</tr>
</tbody>
</table>

**Total number of practical hours** 25

### EXAM TERMS

1. 05/02/2020
2. 20/02/2020
3. 08/07/2020
4. 01/09/2020
5. 15/09/2020

Correction of midterm exams: between two exam terms in February 2020, in agreement with the students.
# Schedule of lectures

<table>
<thead>
<tr>
<th>MATERIAL</th>
</tr>
</thead>
</table>
| **L1.** Introductory lecture.  
General principles of the gastrointestinal wall structure.  
Electrical activity of the gastrointestinal smooth muscle.  
Blood circulation of the digestive system.  
Functional movements of the digestive system.  
Neural control of gastrointestinal functions (intestinal nervous system).  
Food intake, chewing, and swallowing.  
Gastric functions, small and large bowel movements.  
General and locally specific principles of secretion in the digestive system.  
Digestion and absorption of various nutrients (carbohydrates, proteins, fats) in certain segments of the digestive system. |
| **L2.** Disorders of the throat, esophagus, and stomach.  
Disorders of the exocrine pancreatic function.  
Disorders of the small and large intestine.  
Pathophysiological forms and consequences of diarrhea.  
Mechanism and consequences of vomiting.  
Causes and consequences of ileus. |
| **L3.** Eating disorders. |
| **L4.** Physiology of protein metabolism.  
Etiological factors, mechanisms, and consequences of impaired protein metabolism.  
Causes and consequences of protein deficiency.  
Mechanisms and effects of primary and secondary malnutrition.  
Physiology of carbohydrate metabolism and adenosine triphosphate formation.  
Etiological factors, mechanisms, and consequences of impaired carbohydrate metabolism.  
Causes and effects of hyperglycemia.  
Causes and effects of hypoglycemia.  
Disorders of glycogen metabolism. |
| **L5.** Physiology of lipid metabolism.  
Causes, mechanisms, and pathophysiological effects of lipoprotein disorders (primary and secondary hyperlipoproteinemia, other disorders of lipoprotein metabolism).  
Causes, mechanisms, and pathophysiological effects of lipid deposition disorders (lipidosis, atherosclerosis, obesity). |
| **L6.** Macromorphological and micromorphological structure of the liver.  
Basic function unit – hepatic lobule.  
Blood flow through the liver and the hepatic macrophage system.  
System of lymph glands in the liver.  
Liver metabolism of carbohydrates, amino acids, and ammonia.  
Synthesis and degradation of proteins in the liver (glycoproteins, angiotensinogen, coagulation factors, hematopoietic factors, acute phase proteins).  
Detoxification mechanisms (drugs, toxic substances).  
Alcohol metabolism.  
Hormone metabolism.  
Metabolism of lipids (fatty acids and triglycerides) and cholesterol.  
Bilirubin metabolism.  
Biliary tree and the creation, excretion, and role of bile in the digestion and absorption of fat.  
Iron and vitamin storage in the liver. |


L13. Production, secretion, and action of parathyroid hormone and calcitonin. Mechanisms for maintaining calcium and phosphate metabolism. Calcium, phosphate, and magnesium turnover disorders. Disorders with increased or decreased parathyroid hormone formation. Disorders with increased or decreased calcitonin formation.


L15. Components of the metabolic syndrome. Inherited and acquired etiopathogenetic factors of the metabolic syndrome. The role of obesity (adipokine production and release of nonesterified fatty acids from adipose tissue and their action and ectopic accumulation in muscle tissue, liver, and pancreas) in the development of the metabolic syndrome. Release of PAI-1, TNF, IL-6, and resistin, the role in the progression of the metabolic syndrome. The role of insulin resistance in the metabolic syndrome.
Mechanisms and the role of atherogenic dyslipidemia, hypertension, hyperglycemia, prothrombotic, and failure status in the development of cardiovascular diseases.

L16.
Functional structure of male genitalia.
Spermatogenesis and the male sexual act.
Chemical structure, secretion, metabolism, and effects of male sex hormones.
Disorders of male sexual functions.
Functional anatomy of female genitalia.
Female sex hormone system.
Monthly ovarian cycle and the function of gonadotropic hormones.
Ovarian hormone functions, estradiol and progesterone.
Interaction of ovarian and hypothalamic-pituitary hormones.
Female sexual act.
Pregnancy, lactation, and the physiology of the fetus and newborn.

L17.
Strategy of the systemic pathobiological response of the organism under noxious stimuli.
Stress – spontaneous systematic directing of reactivity.
Acute-phase response during an inflammatory process.
Systemic inflammatory response and multiple organ failure.
Immunological patterns of systemic response.
Healing and fibrosation processes and changes in tissue architecture (remodeling).

### Schedule of seminars

<table>
<thead>
<tr>
<th>MATERIAL</th>
</tr>
</thead>
</table>
| Seminar 1.  
Textbook A:  
*Chapter 63.* General Principles of Gastrointestinal Function – Motility, Nervous Control, and Blood Circulation (p. 797–806).  
*Chapter 64.* Propulsion and Mixing of Food in the Alimentary Tract (p. 807–816).  
*Chapter 65.* Secretory Functions of the Alimentary Tract (p. 817–832).  
*Chapter 66.* Digestion and Absorption in the Gastrointestinal Tract (p. 833–842).  
|  
| Seminar 2.  
Textbook B:  
*Chapter 31.* Pathophysiology of the Gastrointestinal System (p. 1452–1491).  
|  
| Seminar 3.  
Textbook A:  
*Chapter 68.* Metabolism of Carbohydrates and Formation of Adenosine Triphosphate (p. 853–862).  
*Chapter 70.* Protein Metabolism (p. 875–880).  
Textbook B:  
*Chapter 6.* Disorders of Metabolism of Basic Substances (p. 250–265; 291–308).  
|  
| Seminar 4.  
Textbook A:  
*Chapter 69.* Lipid Metabolism (str. 863 – 874)  
Textbook B:  
*Chapter 6.* Disorders of Metabolism of Basic Substances (str. 265-291)  
|  
| Seminar 5.  
Textbook B:  
*Chapter 6.* Disorders of Metabolism of Basic Substances (str. 265-291)  
|
Textbook A:
Chapter 72. Dietary Balances; Regulation of Feeding; Obesity and Starvation (p. 887–897).
Chapter 73. Energetics and Metabolic Rate (p. 903–909).

Textbook B:

Seminar 6.
Textbook A:
Chapter 71. Dietary Balances; Regulation of Feeding; Obesity and Starvation; Vitamins and Minerals (p. 897–902).
Textbook B:

Seminar 7.
Textbook A.
Chapter 75. Introduction to Endocrinology (p. 925–937).
Chapter 76. Pituitary Hormones and Their Control by the Hypothalamus (p. 939–950).
Textbook B.

Seminar 8.
Textbook A.
Chapter 77. Thyroid Metabolic Hormones (p. 951–964).
Chapter 78. Adrenocortical Hormones (p. 965–982).
Textbook B.

Seminar 9.
Textbook A.
Chapter 80. Parathyroid Hormone, Calcitonin, Calcium and Phosphate Metabolism, Vitamin D, Bone, and Teeth (p. 1001–1019).
Textbook B.
Chapter 8. Disorders of Water Electrolytes Metabolism (p. 424–446).
Chapter 10. Endocrinopathies (p. 536–539).

Seminar 10.
Textbook A.
Chapter 79. Insulin, Glucagon, and Diabetes Mellitus (p. 983–999).
Textbook B.
Chapter 10. Endocrinopathies (p. 536).

Seminar 11.
Textbook A:
Chapter 81. Reproductive and Hormonal Functions of the Male (and Function of the Pineal Gland) (p. 1021–1035).
Chapter 82. Female Physiology Before Pregnancy and Female Hormones (p. 1037–1054).
Chapter 83: Pregnancy and Lactation (p. 1055–1070).

Required reading:

Schedule of practicals

MATERIAL

Practical I: DIGESTIVE SYSTEM AND METABOLISM

I. Theoretical part:
Seminar content: S 1., S 2., S 3., S 4., S 5.

II. Practical part:
Textbook D:
Practical 50. Effects of Vagus Stimulation and Histamine Injection on Gastric Secretion (p. 186–187).

Textbook C:
Problem 2. Etiopathogenesis of Cystic Fibrosis (p. 5–8).
Problem 117. Pathophysiology of Gluten Sensitive Enteropathy (p. 530–533).
Problem 118. Pathogenesis of Diarrhea in the Cholera Syndrome (p. 534–537).
Problem 119. Pathophysiology of Peptic Disease in the Course of Gastrinoma (Zollinger-Ellison syndrome) (p. 538–541).

Practical II: PHYSIOLOGY AND PATHOPHYSIOLOGY OF LIVER

I. Theoretical part:
Textbook A:
Chapter 71. The Liver as an Organ (p. 881–886).
Textbook B:
Chapter 32. Disorders of Hepatobiliary System (p. 1492–1533).

II. Practical part:
Textbook D:
Practical 52. Consequences of Ligation of the Ductus Choleductus (p. 190–191).

Textbook C:
Problem 124. Pathophysiology of the Obstructive Icterus Caused by Cholelithiasis (p. 561–564).
Problem 126. Pathophysiology of Acute Liver Failure in Hepatitis B (p. 569–573).


D) Rukavina, D., Radošević Stašić, B., Lučin, P., Ćuk, M. Priručnik za vježbe iz fiziologije, neurofiziologije i imunologije [Handbook for Practics in Physiology, Neurophysiology, and Immunology], Katedra za fiziologiju, imunologiju i patološku fiziologiju [Department of Physiology, Immunology, and Pathological Physiology], Medicinski fakultet Rijeka, listopad, 2001.

Additional reading:
### Practical III: SPORTS PHYSIOLOGY

**I. Theoretical part:**

Textbook A:
- **Chapter 44.** Aviation, High Altitude, and Space Physiology (p. 561–568).
- **Chapter 45.** Physiology of Deep-Sea Diving and Other Hyperbaric Conditions (p. 569–574).
- **Chapter 85.** Sports Physiology (p. 1085–1095).

**II. Practical part:**

Textbook D:
- **Practical 48.** Biological Feedback (biofeedback) (p. 176–178).
- **Practical 49.** Physiology of Aerobic Exercise (p. 179–185).

### Practical IV: ENDOCRINOLOGY

**I. Theoretical part:**


**II. Practical part:**

Textbook D:
- **Practical 53.** The Effect of Thyroid Hormone on Oxygen Consumption (p. 192–195).
- **Practical 54.** Induction of Hypocalcemic Tetany in Rats (p. 196–197).
- **Practical 55.** Thorn Test in Rats (p. 198–199).
- **Practical 57.** Glucose Tolerance Test (p. 202–204).
- **Practical 58.** Insulin Hypoglycemia in Rats (p. 205–206).

Textbook C:
- **Problem 36.** Pathophysiology of Hyperfunctioning Thyroid Adenoma Caused by a Point Mutation in the Thyrotropin Receptor (p. 168–172).
- **Problem 38.** Pathophysiology of Hyperosmolal Syndrome in the Course of Newly Diagnosed Diabetes Mellitus (p. 178–182).
- **Problem 20.** Pathogenesis of Diabetes Mellitus Related Chronic Complications (p. 93–97).
- **Problem 39.** Pathogenesis of Primary Aldosteronism (Conn’s syndrome) (p. 183–186).
- **Problem 40.** Pathophysiology of Cushing’s Disease (p. 187–190).

### Practical V: REPRODUCTION

**I. Theoretical part:**

Lecture content: L 16.

Textbook A:
- **Chapter 81.** Reproductive and Hormonal Functions of the Male (and Function of the Pineal Gland) (p. 1021–1034).
- **Chapter 82.** Female Physiology Before Pregnancy and Female Hormones (p. 1037–1054).
- **Chapter 83:** Pregnancy and Lactation (p. 1055–1070).
Chapter 84. Fetal and Neonatal Physiology (p. 1071–1084).

II. Practical part:

Textbook D:

Practical 59. Demonstration of chorionic gonadotropin in urine of pregnant women with the Ascheim-Zondek test (p. 207–208).

Practical 60. Effect of sex hormones on cytologic findings of the vaginal smear in female rats (p. 209–210).

Textbook C:


Required reading:


D) Rukavina, D., Radošević Stašić, B., Lučin, P., Ćuk, M. Priručnik za vježbe iz fiziologije, neurofiziologije i imunologije [Handbook for Practicals in Physiology, Neurophysiology, and Immunology]. Katedra za fiziologiju, imunologiju i patološku fiziologiju [Department of Physiology, Immunology, and Pathological Physiology], Medicinski fakultet Rijeka, listopad, 2001.

Additional reading:

