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|----------------------------|---|-------------------------------|
| <b>Program of Study</b>    | : | GENERAL MEDICINE              |
| <b>Course</b>              | : | Physiology                    |
| <b>Abbreviation</b>        | : | FYZ/VAB12                     |
| <b>Schedule</b>            | : | 45 hours of lectures          |
|                            |   | 15 hours of seminars          |
|                            |   | 45 hours of exercises         |
| <b>Course Distribution</b> | : | 2nd year, 4th semester        |
| <b>Number of Credits</b>   | : | 16                            |
| <b>Course Form</b>         | : | Lectures, seminars, exercises |

**Lectures :**

|                   |  |
|-------------------|--|
| <b>Teachers :</b> | MUDr. PharmDr. Lenka Bartošíková, Ph.D.<br>Doc. MUDr. Jiří Nečas, CSc. |
| <b>Study :</b>    | Continuous   |

|    | <b>Date</b> | <b>Subject</b>                              | <b>Hrs</b> | <b>Teacher</b> |
|----|-------------|---|------------|----------------|
| 1  | 14.02.2023  | Respiratory and renal physiology – repeat.  | 3          | Bartošíková    |
| 2  | 21.02.2023  | Thermoregulation                            | 3          | Bartošíková    |
| 3  | 28.02.2023  | Introduction to endocrinology.              | 3          | Bartošíková    |
| 4  | 07.03.2023  | Hormones of hypothalamus                    | 3          | Bartošíková    |
| 5  | 14.03.2023  | Hormones of pituitary gland.                | 3          | Bartošíková    |
| 6  | 21.03.2023  | Hormones of adrenal cortex                  | 3          | Bartošíková    |
| 7  | 28.03.2023  | Hormones of adrenal medulla                 | 3          | Bartošíková    |
| 8  | 04.04.2023  | Hormones of thyroid and parathyroid glands. | 3          | Bartošíková    |
| 9  | 11.04.2023  | Calcium homeostasis.                        | 3          | Bartošíková    |
| 10 | 18.04.2023  | Female sex physiology I.                    | 3          | Bartošíková    |
| 11 | 25.04.2023  | Female sex physiology II.                   | 3          | Bartošíková    |
| 12 | 02.05.2023  | Male sex physiology.                        | 3          | Bartošíková    |
| 13 | 09.05.2023  | Endocrine function of pancreas.             | 3          | Bartošíková    |
| 14 | 16.05.2023  | Physiology of pain.                         | 3          | Bartošíková    |
| 15 | 23.05.2023  | Physiology of vitamins.                     | 3          | Bartošíková    |

## Exercises:

|                         |   |
|-------------------------|---|
| <b>Leading Teacher:</b> | MUDr. PharmDr. Lenka Bartošíková, Ph.D. |
| <b>Teachers:</b>        | Doc. MUDr. Jiří Nečas, CSc.             |
| <b>Study:</b>           | Continuous                              |

|   | <b>Dates<br/>2023</b> | <b>Subject</b>   | <b>Hrs</b> | <b>Teacher</b>       |
|---|-----------------------|--|------------|----------------------|
| 1 | 13.-19.02.            | <b>Introduction to practical training:</b><br>The rules of the safety of work in physiological laboratory.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Procedure of blood collection and haematological tests.</li> </ul>   | 4          | Bartošíková<br>Nečas |
| 2 | 20.-26.02.            | <b>Introduction to practical training:</b><br>Blood – functions. Blood plasma. Hemoglobine (structure, synthesis, catabolism, function).<br><b>Exercise:</b><br>The technique of blood collection  | 4          | Bartošíková<br>Nečas |
| 3 | 27.02.-<br>05.03.     | <b>Introduction to practical training :</b><br>Multiple-choice <b>Test II.</b><br><b>Physiology of respiration.</b><br><b>Renal physiology.</b><br><b>Physiology of GIT.</b>   | 4          | Bartošíková<br>Nečas |
| 4 | 06.-12.03.            | <b>Introduction to practical training:</b><br>Functional morphology of erythrocytes and reticulocytes. Hematopoiesis. Metabolism of iron.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Determination of Erythrocyte sedimentation rate</li> <li>• Determination of Hematocrit</li> </ul>   | 4          | Bartošíková<br>Nečas |
| 5 | 13.-19.03.            | <b>Introduction to practical training:</b><br>Functional morphology of leukocytes.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Determination of the number of blood elements in peripheral blood: Erythrocytes, Reticulocytes</li> <li>• Determination of the number of blood elements in peripheral blood: Leucocytes count</li> <li>• Differential leukocyte count</li> </ul> | 4          | Bartošíková<br>Nečas |
| 6 | 20.-26.03.            | <b>Introduction to practical training:</b><br>Theoretical background of hemostasis: Vascular contraction, function of platelets.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Determination of the number of blood elements in peripheral blood: Thrombocytes count</li> <li>• Determination of the bleeding time according to Ivy</li> <li>• Rumpel - Leed´s test</li> </ul>    | 4          | Bartošíková<br>Nečas |
| 7 | 27.03.-<br>02.04.     | <b>Introduction to practical training:</b><br>Theoretical background of hemostasis: Blood  | 4          | Bartošíková<br>Nečas |

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|    |                   | coagulation, formation of the clot. Lysis of the blood clots.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• APTT test</li> <li>• Quick's test</li> </ul>   |   |                      |
| 8  | 03.-09.04.        | <b>Introduction to practical training:</b><br>Theoretical background of blood types: AB0 (H) system and Rhesus factor.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Determination of ABO system</li> <li>• Determination of Rhesus factor</li> </ul>  | 4 | Bartošíková<br>Nečas |
| 9  | 10.-16.04.        | <b>Introduction to practical training :</b><br>Multiple-choice <b>Test III.</b><br><b>Blood.</b>  | 4 | Bartošíková<br>Nečas |
| 10 | 17.-23.04.        | <b>Introduction to practical training:</b><br><u>Presentations of students:</u><br>Physiology of the Visual system.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Determination of near and far points of the eye</li> <li>• Determination of visual acuity</li> <li>• Examination of colour vision</li> <li>• Ophthalmoscopy</li> </ul> | 4 | Bartošíková<br>Nečas |
| 11 | 24.04.-<br>30.04. | <b>Introduction to practical training:</b><br><u>Presentations of students:</u><br>Physiology of hearing.<br>Vestibular system<br>Chemical senses.<br><b>Exercise:</b> <ul style="list-style-type: none"> <li>• Hearing tests by using the tuning forks.</li> </ul>   | 4 | Bartošíková<br>Nečas |
| 12 | 01.-07.05.        | <b>Introduction to practical training :</b><br><u>Presentations of students:</u> Nervous system.  | 4 | Bartošíková<br>Nečas |
| 13 | 08.-14.05.        | <b>Introduction to practical training:</b><br>Multiple-choice <b>Test IV.</b><br><b>Physiology of senses</b>  | 4 | Bartošíková<br>Nečas |
| 14 | 15.-21.05.        | <b>Introduction to practical training :</b><br>Substitutions.   | 4 | Bartošíková<br>Nečas |
| 15 | 22.-28.05.        | <b>Exercise:</b><br>Final assessment (interview).<br>Credit.  | 4 | Bartošíková<br>Nečas |

**Completed by :** Zp (zápočet/credit), Zk (examination)

**Requirements :** To get a credit, the students must take part in all seminars, all practical

training, pass all the tests successfully, be interested in practical topics, use practical methods and put down notes. At the end of 4<sup>th</sup> semester the students must also pass final assessment (interview). Students are allowed to sit for examination only if they have received credits in winter and summer semesters. The examination includes the classic oral exam.

## **Literature :**

### **a) basic**

1. Arthur C. Guyton, John E. Hall: Textbook of Medical Physiology, ed.: W. B. Saunders Comp., 11th ed., 2005.
2. John E. Hall.: Guyton and Hall Textbook of Medical Physiology, ed.: Saunders Elsevier, 12<sup>th</sup> ed., 2011.
3. John E. Hall.: Guyton and Hall Textbook of Medical Physiology, ed.: Elsevier, 13<sup>th</sup> ed., 2016.
4. Bartošíková L., Luža J., Nečas J.: Practical Physiology, ed.: Palacký University Olomouc, 1<sup>st</sup> ed., 2009.

### **b) additional**

5. William F. Ganong: Review of Medical Physiology eds.: The McGraw-Hill Companies, Inc., 22<sup>nd</sup> ed, 2005.

## **Physiology – examination questions 2022/2023**

### **Part A**

1. Blood (main functions, blood plasma).
2. Red blood cells (without hemoglobin).
3. Hemoglobin. Metabolism of iron.
4. White blood cells.
5. Specific immunity.
6. Non-specific immunity.
7. Primary hemostasis. Anticoagulantia.
8. Secondary hemostasis. Fibrinolysis.
9. Blood systems ABO, Rh. Blood compatibilities.
10. Physiology of mouth cavity. Esophagus.
11. Physiology of the stomach. Vomiting.
12. Physiology of the small and large intestine. Defecation.
13. Motility of GIT, mechanisms of control.
14. Hormones of GIT.
15. Exocrine function of pancreas.
16. Function of gall bladder, composition and bile function.
17. Autonomic nervous system – sympathetic division.
18. Autonomic nervous system – parasympathetic division.
19. Skeletal muscle.
20. Smooth muscle.

21. Cardiac muscle. Excitation – contraction coupling in myocardium.
22. Differences between action potentials of working and pacemaker cells of cardiac muscle.
23. Cardiac cycle.
24. Cardiac output. Regulating factors.
25. ECG curve. Electrical heart axis.
26. Hemodynamics - blood circulation in arterial system.
27. Hemodynamics - blood circulation in venous system.
28. Blood pressure. Factors controlling blood pressure.
29. Venous return. Regulating factors.
30. Coronary blood flow. Metabolism of cardiac muscle.
31. Cardiovascular and respiratory functions during exercise.
32. Physiology of visual system.
33. Physiology of hearing.
34. Physiology of vestibular system.
35. Physiology of the taste and smell.
36. Introduction to endocrinology (mechanism of action of hormones, types of hormones, types of feedback, second messengers).
37. Hypothalamus (functions, hormones)
38. Hormones of pituitary gland – adenohypophysis.
39. Hormones of the pituitary gland – neurohypophysis.
40. Hormones of adrenal cortex – glucocorticoids.
41. Hormones of adrenal cortex – mineralocorticoids, androgens.
42. Hormones of adrenal medulla.
43. Hormones of thyroid gland
44. Hormones of parathyroid gland.
45. Endocrine function of pancreas.
46. Male reproductive functions.
47. Endocrine functions of testes.
48. Female reproductive functions.
49. Endocrine function of ovaria.
50. Pregnancy, parturition, lactation.

## **Part B**

1. Physiology of the cell (organelles, composition of ICF).
2. Physiology of the plasma membrane (functions, composition, rest and action membrane potential, ion channels).
3. Types of transport across the plasma membrane.
4. Physiology of neuron. Glial cells.
5. Synapse (processes on synapse, example).
6. Neurotransmitters, synaptic receptors.
7. Physiology of liver (main functions).
8. Thermoregulation.
9. Digestion, absorption and metabolism of carbohydrates.
10. Digestion, absorption and metabolism of lipids
11. Digestion, absorption and metabolism of proteins.
12. Vitamins soluble in water.
13. Vitamins soluble in lipids.
14. Body fluids - overview.

15. The role of  $\text{Na}^+$  in homeostasis.
16. The role of  $\text{K}^+$ ,  $\text{Cl}^-$  in homeostasis.
17. The role of  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  in homeostasis.
18. Physiology of pain.
19. Energy intake and energy expenditure.
20. Acid-base balance – basic mechanisms, role of hemoglobin and lungs.
21. Acid-base balance – basic mechanisms, role of kidney.
22. Renal blood flow (circulation), regulation.
23. Glomerular filtration, filtration fraction.
24. Functional tests of kidney.
25. Renin-angiotensin-aldosterone system.
26. Proximal tubule, loop of Henle.
27. Distal tubule, collecting duct.
28. Osmotic, pressure and water diuresis.
29. Formation of hypertonic and hypotonic urine.
30. The role of kidney in regulation of  $\text{Na}^+$  in plasma.
31. The role of kidney in regulation of  $\text{K}^+$  in plasma.
32. Multiple control of the kidney function.
33. Mechanics of breathing.
34. Lung volumes and capacities.
35. Compliance in the respiratory system, surface tension, surfactant.
36. Airway resistance, influencing factors.
37. Alveolar ventilation.
38. Diffusion of gases through the respiratory membranes.
39. Central control of breathing.
40. Role of receptors (chemoreceptors, mechanoreceptors) in control of breathing.
41. Pulmonary circulation.
42. Cerebral blood flow.
43. Cerebrospinal fluid, brain metabolism.
44. Physiology of the spinal cord.
45. Physiology and functions of cerebellum.
46. Physiology and functions of basal ganglia.
47. Physiology of cerebral cortex.
48. Reticular formation. Limbic system.
49. Learning and memory.
50. Somatic sensation, general organization, classification of receptors, general organization of the somesthetic input.