QUESTIONS FOR THE ORAL PART OF THE FINAL EXAMINATION IN PHYSIOLOGY
– GENERAL MEDICINE

General physiology and neurophysiology, physiology of the muscle
1. Basic principles of physiological regulations: feedback mechanism, homeostasis
2. Resting transmembrane potential
3. Receptor (generator) potential, coding of the stimulus strength on the receptive and conductive membrane
4. Function of the receptors, classification, sensory modalities, adaptation of the receptors
5. Action potential, factors determining generation of the action potential, the „all or nothing“ law, refractory periods
6. Peripheral nerve – its structure and regeneration, types of nerve fibres, conduction of the action potential on a nerve fibre, axon action potential and compound action potential
7. Classification of neurons and synapses, excitatory and inhibitory postsynaptic potentials, ionotropic and metabotropic receptors, function of ion channels
8. Neuromuscular transmission - function of the motor end-plate, excitation-contraction coupling in the skeletal muscle
9. Motor unit, regulation of the strength of muscle contraction, muscle fatigue
10. Classification of the skeletal muscles, types of muscle fibres and muscle contractions
11. Classification, excitation and contraction of the smooth muscle
12. Reflex, reflex arc, classification of reflexes

Physiology of the central nervous system and autonomic nervous system
13. Function of glial cells, function of cerebrospinal fluid, blood-brain barrier, circumventricular organs
14. Development of the CNS
15. Neurotransmitters and neuromodulators, their role in central brain functions (glutamate, GABA, ACH, NA, serotonin, dopamine)
16. Function of the sensory division of the CNS, sensation and perception of a stimulus
17. Reticular activation system (RAS), its function in maintaining attention and sleep introduction
18. Sleep, stages of sleep
19. Electric activity of the brain, electroencephalogram, evoked potentials
20. Functions of motor division of the CNS, classification of muscle movements from the aspect of their regulation
21. Functions of the spinal cord, basal ganglia and cerebellum in regulation of the body posture and body movements
22. Reflex and voluntary regulation of the movements of the skeletal muscles
23. Function of the muscle spindle, alpha-gamma co-activation
24. Hierarchical organization of the CNS, association areas of the brain cortex and their functions
25. Speech – brain centres and speech disorders
26. Functional specialization of the cerebral hemispheres and sexual dimorphism
27. Memory and its classification, brain structures associated with memory
28. Association and non-association learning (habituation, sensitization, conditioning)
29. Emotions and their functions, function of the limbic system
30. Function of the autonomic nervous system

Physiology of the endocrine system and reproduction
31. General principles of endocrine regulations, classification of hormones and mechanisms of their action
32. Endocrine function of hypothalamus and the hypothalamo-hypophyseal system
33. Function of adenohypophysis
34. Function of neurohypophysis and epiphysis
35. Function of the thyroid gland
36. Function of the parathyroid glands, endocrine regulation of calcium and phosphate metabolism
37. Endocrine function of the pancreas
38. Function of the adrenal cortex
39. Function of the adrenal medulla
40. Function of the male reproductive organs
41. Functions of the female reproductive organs, menstrual cycle
42. Fertilization, hormonal changes in pregnancy, function of placenta, birth and breastfeeding
43. Response of the human organism to stress
44. Neuro-immuno-endocrine interactions

**Physiology of the cardiovascular system**
45. Physiological properties of the cardiac muscle – automacy and rhythmicity
46. Physiological properties of the cardiac muscle – conductivity
47. Physiological properties of the cardiac muscle – excitability
48. Physiological properties of the cardiac muscle – contractility
49. The cardiac cycle and blood pressures in the cardiac atria and ventricles
50. Cardiac output and factors that determine it. Volumes – enddiastolic, systolic, endsystolic and ejection fraction of the heart
51. Preload, afterload and factors that influence them
52. Heart sounds and phonocardiography
53. Recording of the electrocardiogram
54. ECG curve a and its evaluation
55. Frank-Starling autoregulation mechanism of the heart, metabolism of the cardiac muscle
56. Haemodynamics in the vessels – blood distribution, pressure gradients, velocity and type of blood flow, the flow rate
57. Arterial haemodynamics
58. Venous haemodynamics
59. Haemodynamics in capillaries and transcapillary exchange of water and substances
60. Blood pressure, factors that determine and influence the blood pressure
61. Blood pressure and its measurement. Arterial pulse and its measurement
62. Structure and functions of the lymphatic system and the spleen
63. Lymph – formation, composition and the lymph flow
64. Nervous regulation of the cardiovascular system
65. Humoral regulation of the cardiovascular system, effect of the temperature on heart
66. Specifics of the coronary and the pulmonary circulation
67. Specifics of the cerebral circulation, and the circulation in the skeletal muscle
68. Specifics of the renal and hepatic circulation, and circulation of the skin

**Physiology of special senses**
69. Smell and taste
70. Somatovisceral sensory system
71. Pain – mechanisms, classification, phantom pain, referred pain, influencing the pain perception
72. Vision – optical system of the eye, accomodation, ammetropias
73. Vision: function of the retina, colour vision, central and peripheral vision
74. Binocular vision and three-dimensional visual perception, visual field and scotomas; visual pathway
75. Hearing
76. Sense of balance
Body fluids, physiology of the kidneys and acid-base balance
77. Body fluids - classification, function, composition, daily water balance, osmosis
78. Glomerular filtration
79. Function of the proximal tubule
80. Function of the loop of Henle
81. Function of the distal tubule and collecting duct
82. Regulation of the volume and osmolarity of urine
83. Function of the urinary tract (from calyces to the urethra), micturition, urine - volume and composition
84. Assessment of the renal functions
85. Regulation of the acid-base balance – buffer systems in blood
86. Regulation of the acid-base balance – function of the respiratory system and kidneys

Physiology of blood
87. Functions, composition and properties of blood, hematocrit and erythrocyte sedimentation rate
88. Blood plasma – composition and functions, osmotic and oncotic pressure
89. Erythrocytes – characteristics and functions, haemoglobin
90. Leukocytes – characteristics and functions, immunization
91. Haemostasis
92. Blood groups - ABO system, transfusion and compatibility, cross matching test
93. Blood groups - Rh factor, transfusion and compatibility, cross matching test
94. Haemopoiesis

Physiology of the respiratory system
95. Functions of the respiratory passageways, regulation of the smooth muscles in the respiratory passageways, ciliary activity and mucus in the respiratory passageways, cough and sneezing
96. Mechanism of inspiration and expiration
97. Intrapleural and intrapulmonal pressures and their changes during respiratory cycle
98. Lung volumes and capacities
99. Lung ventilation and its changes
100. Dead space, alveolar ventilation
101. Surface tension of the alveoli, surfactant, lung compliance
102. Concentrations of O₂ and CO₂ in the atmosphere and in alveolar air, partial pressures of gases
103. Exchange of respiratory gasses and factors that influence it
104. Transport of O₂ in blood, oxygen- haemoglobin association-dissociation curve
105. Transport of CO₂ in blood, haemoglobin - CO₂ association-dissociation curve
106. Function of the respiratory centre and control of breathing
107. Receptors participating in regulation of respiration
108. Specifics of respiration under water and decompression syndrome
109. Specifics of respiration in high altitudes

Physiology of gastrointestinal system and the liver
110. Mastication, swallowing and the function of oesophagus
111. Motor functions of the stomach, vomiting
112. Motility in the small and large intestine, defaecation
113. Secretion, composition and functions of saliva
114. Secretion, composition and functions of the gastric juice
115. Secretion, composition and functions of the pancreatic juice
116. Secretion, composition and functions of the bile
117. Secretion in the small and large intestine
118. Regulation of the function of gastrointestinal system
119. Function of the liver and gallbladder
120. Gastrointestinal microbiota, gasses in the digestive system, composition of faeces
121. Absorption in the gastrointestinal system and its mechanisms

**Metabolism, nutrition and thermoregulation**
122. Basal metabolic rate and factors that influence the BMR
123. The total daily energy expenditure and types of energy balance, energy value of nutrients
124. Metabolism in physical activity, oxygen debt and efficiency of the physical work
125. Methods of determination of the metabolic rate, energy equivalent, respiratory quotient
126. Carbohydrates – functions, classification, food sources, digestion, absorption, main metabolic pathways
127. Proteins – functions, classification, food sources, digestion, absorption, main metabolic pathways
128. Fats – functions, classification, food sources, digestion, absorption, main metabolic pathways
129. Vitamins - characteristics, functions, food sources
130. Minerals - characteristics, functions, food sources
131. Regulation of metabolism and main metabolic pathways in fed state and fasting state (starvation)
132. Healthy nutrition guidelines and recommendations, current dietary pattern and its health risks
133. Vegetarian nutrition and other types of alternative nutrition, their positive and negative health effects
134. Regulation of the food intake
135. Heat balance in the body, mechanisms of heat production and heat loss, normal body temperature and its biorhythms, fever
136. Reaction of the body to heat and cold, nervous and humoral mechanisms of thermoregulation
THE LIST OF TASKS FOR PRACTICAL EXAMINATION:

1. Determination of haematocrit value (P)
2. Erythrocyte count (P)
3. Determination of blood groups of AB0 system (P)
4. Determination of haemoglobin content (P)
5. Teichmann’s crystals (P)
6. The leukocyte count (P)
7. Leukogram (using of pre-prepared blood smear) (P)
8. Determination of Rh factor (P)
9. Determination of bleeding time by Duke (P)
10. Blood pressure measurement (P)
11. Reactive hyperaemia (P)
12. ECG (P)
13. Examination of arterial pulse (P)
14. Measurement of vital capacity (P)
15. Functional lung examination – spirometry (P)
16. Determination of the basal metabolic rate (P)
17. Transport of food through the oesophagus (P)
18. Calculation and evaluation of the daily energy and nutrient intake (proteins, fats, carbohydrates) (P)
19. Determination of metabolism during physical work (energy expenditure, efficiency of work, oxygen debt, pulse oxygen) (P)
20. Determination of the central visual acuity (P)
21. Purkinje’s images and keratoscopy (P)
22. Ophtalmoscopy (P)
23. Perimetry – examination of the visual field (P)
24. Additive mixing of colours, successive and simultaneous contrast (P)
25. Examination of colour vision (P)
26. Tests with tuning forks (P)
27. Audiometry (P)
28. Otoscopy – examination of the external ear (P)
29. Detection of taste sensations (P)
30. Examination of the cutaneous sensitivity (P)
31. Examination of reflexes (P)
32. Calculation of the daily energy expenditure by using tables (P)
33. Reaction of pupils to illumination and accommodation stimulus (P)
34. Hering’s model of the respiratory system and parallelogram (P)
35. Determination of the sedimentation rate of erythrocytes using the Fahreus – Westergren method (T)
36. Determination of erythrocyte osmotic resistance (T)
37. Haemolysis (T)
38. Cross-matching (major and minor crossmatches) (T)
39. Blood coagulation time determination by Lee-White method (T)
40. Determination of prothrombin time by Quick (T)
41. Assessment of oxygen-hemoglobin saturation with the pulse oxymeter (P)
42. Assessment of the muscle strength in humans (P)
43. The influence of increasing CO₂ and decreasing of O₂ concentration on respiration (T)
44. Analysis of respiratory gases (SPIROLYT) (T)
45. Determination of work and fatigue in humans (Moss’ ergograph) (T)
46. Evaluation of nutritional status - basic anthropometric measurements (P)
47. Assessment of the motor handedness (P)
48. Examination of nystagmus (T)
49. Detection of olfactory sensation (Henning) (T)
50. Purkinje’s figure (P)
51. Stereoscopic vision (T)
52. Auscultation of the heart sounds (T)
53. Functional tests of the cardiovascular system (Orthostatic test, Ruffier test) (T)
54. Examination of the short-term memory (T)
55. Determination of glycaemia by glucometer (T)
56. Measurement of the expiratory peak flow with a peak flow meter Vitalograph (P)

P – the student will perform the task and he/she will write a short protocol where also results or his/her observation will be described

T – it is not required to perform the task, the student will describe the procedure of the task and he/she will write a short protocol where also possible results or expected observations will be described

Protocol (from T or P task) will be attached with examination test to personal card of student.