

QUESTIONS FOR THE ORAL PART OF THE FINAL EXAMINATION IN PHYSIOLOGY

– GENERAL MEDICINE

General neurophysiology and physiology of the muscle

1. Resting transmembrane potential
2. Receptor (generator) potential, coding of the strength of the sensory stimuli
3. Function of the receptors, classification, sensory modalities, adaptation of the receptors
4. Action potential, the „all or nothing“ law, refractory periods
5. Factors determining generation of the action potential, Weiss-Hoorweg law of stimulation, du Bois-Reymond's law
6. Conduction of the action potential, types of nerve fibres and regeneration of the peripheral nerve
7. Classification of neurons and synapses, excitatory and inhibitory postsynaptic potentials
8. Mechanisms of activation and inhibition of postsynaptic neurons, function of the ion channels
9. Neuromuscular transmission - function of the motor end-plate
10. Excitation – contraction coupling in the skeletal muscle
11. Motor unit, regulation of the strength of muscle contraction, muscle fatigue
12. Classification of the skeletal muscles, types of muscle fibres and muscle contractions
13. Classification, excitation and contraction of the smooth muscle
14. Reflex, reflex arc, classification of reflexes

Physiology of the central nervous system

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. Pain – mechanisms of sensation and types, mechanism of hypoalgesia and the referred pain
18. Reticular activation system (RAS), its function in maintaining attention and sleep introduction
19. Sleep, stages of sleep
20. Electric activity of the brain, electroencephalogram, evoked potentials
21. Functions of motor division of the CNS, classification of muscle movements
22. Pyramidal pathway, extrapyramidal pathways and their functions
23. Regulation of the body posture and body movements
24. Functions of the spinal cord in regulation of the body posture and body movements
25. Functions of the basal ganglia and cerebellum in regulation of the body posture and body movements
26. Regulation of the movements of the skeletal muscles
27. Function of the muscle spindle, alpha-gamma co-activation
28. Hierarchical organization of the CNS, association areas of the brain cortex and their functions
29. Speech – brain centres and speech disorders
30. Functional specialization of the cerebral hemispheres and sexual dimorphism
31. Memory, classification, brain structures
32. Association and non-association learning (habituation, sensitization, conditioning)
33. Emotions and their functions, the limbic system
34. Physiology of the autonomic nervous system

Physiology of the endocrine system and reproduction

35. Mode of action of hormones and endocrine control
36. Function of the hypothalamo-hypophyseal system
37. Function of adenohypophysis
38. Function of neurohypophysis and epiphysis
39. Function of the thyroid gland

40. Function of the parathyroid glands, endocrine regulation of calcium and phosphate metabolism
41. Function of the adrenal cortex
42. Function of the adrenal medulla
43. Function of the male reproductive organs
44. Functions of the female reproductive organs, menstrual cycle
45. Fertilization, hormonal changes in pregnancy, function of placenta, birth and breastfeeding
46. Endocrine function of the pancreas
47. Response of the human organism to stress

Physiology of the cardiovascular system

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

Physiology of special senses

73. Smell and taste
74. Somatovisceral sensory system
75. Pain
76. Vision – optical system of the eye, accommodation, ametropias
77. Vision: function of the retina, colour vision, central and peripheral vision
78. Binocular vision and three-dimensional visual perception; visual field and scotomas; visual pathway
79. Hearing
80. Sense of balance

Body fluids, physiology of the kidneys and acid-base balance

81. Body fluids- classification, function, composition, daily water balance, osmosis
82. Function of glomeruli

83. Function of the proximal tubule
84. Function of the loop of Henle
85. Function of the distal tubule and collecting duct
86. Regulation of the volume and osmolarity of urine
87. Function of the urinary tract (from calyces to the urethra), micturition, urine – volume and composition
88. Tests of renal functions
89. Regulation of the acid-base balance – buffer systems in blood
90. Regulation of the acid-base balance – function of the respiratory system and kidneys

Physiology of blood

91. Functions, composition and properties of blood, homeostasis
92. Blood plasma – composition and functions, osmotic and oncotic pressure
93. Erythrocytes – characteristics and functions, haemoglobin
94. Leukocytes – characteristics and functions
95. Leukocytes and immunity
96. Haemostasis
97. Blood groups - ABO system, transfusion and compatibility, cross matching test
98. Blood groups - Rh factor, transfusion and compatibility, cross matching test
99. Haemopoiesis

Physiology of the respiratory system

100. Functions of the respiratory passageways and regulation of the smooth muscles in the respiratory passageways
101. Mechanism of inspiration and expiration
102. Intrapleural and intrapulmonary pressures
103. Lung volumes and capacities
104. Lung ventilation and its changes
105. Dead space, alveolar ventilation
106. Surface tension of the alveoli, surfactant, lung compliance
107. Curve of relaxation pressures and curves of maximal respiratory pressures
108. Concentrations of O₂ and CO₂ in the atmosphere and in alveolar air, partial pressures of gases
109. Exchange of respiratory gases - alveolocapillary barrier, diffusion capacity of the lungs
110. Transport of oxygen in blood, oxygen- haemoglobin association-dissociation curve
111. Transport of CO₂ in blood, haemoglobin - CO₂ association-dissociation curve
112. Function of the respiratory centre and the influence of higher centres of the CNS
113. Receptors participating in regulation of respiration
114. Protective reflexes of the respiratory system and ciliary activity
115. Respiration under water and decompression syndrome
116. Respiration in high altitudes

Physiology of gastrointestinal system

117. Functions of the gastrointestinal system
118. Autonomic control of the gastrointestinal motility and secretion
119. Humoral control of the gastrointestinal motility and secretion
120. Mastication, swallowing and the function of oesophagus
121. Motor functions of the stomach
122. Motility in the small and large intestine, defaecation
123. Vomiting
124. Secretion, composition and functions of saliva
125. Secretion, composition and functions of the gastric juice
126. Secretion, composition and functions of the pancreatic juice

127. Secretion, composition and functions of the bile
128. Secretion in the small and large intestine
129. Function of the liver and gall bladder
130. Gastrointestinal flora, composition of faeces
131. Absorption in the gastrointestinal system and its mechanisms

Metabolism, nutrition and thermoregulation

132. The total energy expenditure and types of energy balance
133. Basal metabolic rate and factors that influence the BMR
134. Metabolism in physical activity, oxygen debt and efficiency of the physical work
135. Methods of determination of the metabolic rate, energy equivalent, respiratory quotient
136. Digestion, absorption and metabolism of carbohydrates
137. Digestion, absorption and metabolism of proteins
138. Digestion, absorption and metabolism of fats
139. Proteins, fats and carbohydrates - characteristics, functions, food sources, energy value
140. Vitamins and minerals - characteristics, functions, food sources, absorption
141. Current situation in nutrition, healthy nutrition guidelines and recommendations
142. Vegetarian nutrition and other types of alternative nutrition
143. Regulation of food intake
144. Normal body temperature, its biorhythms and measurement, fever
145. Heat balance in the body, mechanisms of heat production and heat loss
146. Mechanisms of thermoregulation
147. Reaction of the body to heat and cold

THE LIST OF TASKS FOR PRACTICAL EXAMINATION:

1. Determination of haematocrit value (P)
2. Erythrocyte count (P)
3. Determination of blood groups of ABO 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 keratotomy (P)
22. Ophthalmoscopy (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 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. Lung and thorax relaxation curve (T)
42. (the question was excluded from the list, the task has not been performed in the practicals)
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. Models of eye, demonstration of formation of a visual image on the retina (T)

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. Measurement of reaction time and examination of the short-term memory (T)

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.