Перечень экзаменационных вопросов по нормальной физиологии для иностранных студентов 2 курса специальности «Лечебное дело» (обучение с включенным английским языком)

1. Normal Physiology is the science studying functions and vital processes in an organism, mechanisms to regulate functions and processes. Physiology is the base for medical study.
2. Physiology is the experimental science. Types of physiological experiments.
3. Blood as a part of the organism internal medium. Body fluids, homeostasis. Blood functions. The amount of blood in the human body and methods to measure it.
4. Composition of the blood; hematocrit index. Blood cells and the total count of each cells type.
5. Composition of plasma. General constants of the blood: viscosity, specific gravity, erythrocyte sedimentation rate (ESR),
6. Osmotic pressure, oncotic pressure of plasma, blood pH. Blood buffer systems.
7. Red blood cells (erythrocytes): total count, methods to determine. Functions of red blood cells. Different types of hemolysis.
8. Hemoglobin: properties of hemoglobin, different compounds of Hb. Level of Hb in the blood. Methods to determine. Color index: formula for color index calculation; clinic importance.
9. White cell blood (leucocytes). Normal total count and deviation in total count of white blood cells. Leucopenia, leucocytosis.
10. Differential count of the different leucocytes types (leucocyte formula; leycogramm). Functions of different leucocytes types.
11. Blood groups, main blood antigen systems. Blood groups according to ABO antigen system. Blood typing.
12. Transfusion reactions. Rules of hemotransfusion. Blood groups of the Rh-Hr antigen system.
13. Hemostasis: primary and secondary hemostasis. Blood platelets (structure, total count, functions). Primary hemostasis. Mechanism of the platelet plug formation. Screening tests of the primary hemostasis (the platelet count and the bleeding time).
14. Secondary hemostasis - blood coagulation. Clotting factors, general scheme of the blood coagulation reactions.
15. Formation of the fibrin clot. Screening tests of the blood coagulation (clotting time and prothrombine time).
16. Clot retraction and fibrinolysis. Fibrinolytic system components and their activation. Lysis of the blood clot. Anticoagulants (primary and secondary).
17. Nerve and hormone regulation of RBC and WBC production.
18. Circulation: its significance in living organism. General scheme and components of cardiovascular system. Hemodynamics in systemic and pulmonary of circulation.
19. Heart: function, roles of atria, ventricles and valves. Cardiac cycle (periods and phases; their duration; states of valves, pressure values and direction of blood flow in each phase of cardiac cycle).
20. Physiological features of cardiac muscle and its particularities compared with skeletal muscle.
21. Heart automatism: conductive system of the heart and its functions, automatic gradient. Electrophysiological parameters of pacemaker cells.
22. Electrocardiography: ECG graph in standard lead II. Genesis of ECG waves, segments and intervals; their parameters; medical importance of ECG.
23. Electrocardiography: dipole concept; vectors of heart electromotive forces; ECG leads; axises of ECG lead and their directions. Electrical axis of heart.
24. Phonocardiography (PhCG): origin of heart sounds; clinical significance of PhCG method.
25. Cardiac output (CarO): notion; values; influencing factors.
26. Intrinsic regulation of heart pumping. The Frank-Starling mechanism.

27. Nerve control of heart activity. Innervation of heart by sympathetic and parasympathetic nerves. Mechanisms of nerve regulation (appropriate neurotransmitters, autonomic ganglia and receptor types).
28. Hemodynamics: principle laws and their mathematical expression. Functional classification of blood vessels; change of cross-section area, resistance, pressure and blood flow velocity along the vascular bed.
29. Blood flow along arteries: moving forces, character of flow, linear and volume velocities of blood flow.
30. Arterial pulse and its origin. Sphygmography: scheme of sphygmogram and its analysis, importance for medicine.
31. Blood flow along capillary: parameters of capillary; capillary pressure and linear velocity of blood flow. Mechanisms of nutrient exchange between blood and tissues.
32. Blood flow along veins in systemic circulation: linear velocity of blood flow; venous pressure. Venous return and cardiac output.
33. Lymphatic system: its characteristics; composition and amount of lymph; mechanism of lymph production. Importance of lymph drainage.
34. Nerve control of vascular tone. Vasomotor center. Vasoconstriction and vasodilatation.
35. Hormone control of vascular tone. Effects of ions and other chemicals on blood vessels. Local control of blood flow according to tissue metabolic needs, mechanisms of blood flow control.
36. Region blood flow: pulmonary, coronary, cerebral, renal, cutaneous.
37. Reflex control of systemic arterial pressure: aortic and carotid receptors (reflexes, scheme of reflex arch).
38. Respiration: definition, significance. 5 stages of respiratory process. External respiration. Respiratory functions of lungs, airways and thoracic cage. Non-gas exchange functions of lungs.
39. Negative intrapleural pressure: nature, changes during respiration, significance for respiration and circulation.
40. Mechanics of breathing: movement of air in and out of the lungs during inspiration and expiration.
41. Lung ventilation: parameters of lung ventilation. Lung volumes and capacities, methods to measure, normal value. Dynamic parameters of lung ventilation: minute lung ventilation. Composition of inspired, expired, and alveolar air.
42. Gas exchange in lungs. Gas partial pressures in the alveoli and in the arterial and venous blood. Other factors assisting in gas diffusion. Ventilation-perfusion relationships.
43. Transport of O_2 in the blood. Total O_2amount in the blood. Dissolved O_2 and O_2 partial pressure in arterial and venous blood. O_2 combination with hemoglobin. Oxygen-hemoglobin dissociation-saturation curve and its physiological advantages. Factors shifting the position of this curve.
44. Transport of carbon dioxide in the blood. Dissolved CO_2 and CO_2 partial pressure in arterial and venous blood. CO_2 as bicarbonate and in combination with blood proteins as carbamino compounds.
45. General scheme of gas exchange processes in tissues and alveoli (chemical and physical processes).
46. Respiratory center, its localization and neuron structure. Automatic activity of respiratory center. Modern theories about origin of respiratory center automatic activity.
47. Control of breathing. Sensor and effector parts of respiratory control system. Importance of mechanoreceptors of lungs, airways and respiratory muscle in the respiration control. Hering-Breuer reflexes.
48. Chemical control of respiration. Adequate stimuli to increase ventilation by means of central and arterial chemoreceptors. The nature of the first inspiration in newborns.
49. Respiration at low atmospheric pressure. Acute mountain sickness. Respiration at increased atmospheric pressure. Decompression sickness (dysbarism). Artificial respiration. Hyperbaric oxygen therapy. Oxygen toxicity.
50. Transformation of energy and energy balance. Basal metabolic rate in healthy person. Factors determining BMR. Total metabolic rate and factors determining its energy expenditure.

51. General principles of energy assimilation in a body. Caloric values of foodstuff. Physical and physiological caloric quotients of proteins, fats and carbohydrates.
52. Direct and indirect calorimetry methods. Respiratory quotient, caloric value of oxygen and their significance in studies of metabolism.
53. Nutrition. Physiologic dietary standards according to person's daily energy expenditure. Thermogenic food effect.
54. Energy supply. Isodynamic law and its relativity. General recommendations for dietary balance.
55. Temperature regulation. Body temperature and homoeothermy. Temperature map of body.
56. General characteristics of gastrointestinal system: basic processes of digestion, digestive and nondigestive functions, types of digestion.
57. Digestion in the oral cavity: composition and amount of saliva, its digestive and nondigestive functions, mechanism of secretion, regulation of salivary secretion. Mechanism of swallowing.
58. Digestion in the stomach: composition and amount of gastric juice, functions of enzymes, mucus, hydrochloric acid.
59. Digestion in the stomach: phases of gastric secretion, nerve and hormone mechanisms of regulation. Motor functions of the stomach, passage of chime from the stomach to the duodenum.
60. Digestion in duodenum: general characteristics, role of pancreas in digestion (pancreatic juice, its chemical composition, amount, enzymes); regulation of pancreatic secretion.
61. Liver: role of liver in digestion (composition of bile, regulation of the bile secretion and gallbladder emptying), nondigestive functions of the liver.
62. Digestion in the small intestine: amount and composition of the small intestine secretion, role of its various compounds in intraluminal and parietal digestion. Movements of small intestine, regulation.
63. Digestion in the large intestine: regions of the large intestine and their innervation, evacuation of chime from the small intestine to the large intestine, amount, chemical composition and role of large intestine secretion in digestion, bacteria in the colon.
64. Absorption in gastrointestinal tract: intensity of the absorption in different parts of gastrointestinal tract, mechanisms of absorption.
65. Hunger and satiety. Mechanisms of active choice of food. Periodical activity of gastrointestinal tract.
66. Importance of excretory processes for the living body; role of different organs in excretory function. Kidney as excretory organ: nephron as renal functional unit.
67. Basic kidney excretory processes. General mechanisms of different substances transport across nephron tubule membranes. Threshold elimination, "threshold" and "no-threshold" substances.
68. Role of renal glomeruli in uropoesis. Properties of the filtration barrier. Glomerular filtration rate (GFR). Clearance methodic to study GFR.
69. Role of nephron proximal tubular segment in uropoesis: reabsorption (reabsorbed substances; rate of proximal tubule reabsorption; mechanisms of reabsorption); secretion (secreted substances, mechanisms of secretion).
70. Role of the loop of Henle in uropoesis. Solute and water transport in the loop of Henle. Mechanism of formation and maintenance of high osmolarity in the renal medullary interstitial fluid; its importance for renal excretory function.
71. Role of nephron distal convoluted tubule and collecting duct in formation of final (secondary) urine.
72. Secretion and reabsorption of minerals, water, and urea (it's recycling); hormone mechanism of this process regulation.
73. Role of kidneys in maintenance of physiological constants: mechanisms of volume regulation, osmolarity of body fluids.
74. Role of kidneys in maintenance of physiological constants: mechanisms of regulation of electrolyte concentrations, arterial pressure regulation.
75. Role of kidneys in acid-base balance regulation. Nerve regulation of renal excretory function. Volume, composition and properties of final (secondary) urine compared to primary urine.

76. The problem of excitability and irritability, excitable and non-excitable tissues. Stimuli: definitions, types, characteristics.
77. Resting membrane potential (RMP): its parameters, mechanism of formation, the diagram of registration.
78. Action potential: its parameters, diagram of nerve fiber AP recorded with intracellular microelectrode, phases of AP, ion mechanism.
79. Phasic changes of excitability during action potential development. The comparative analysis of acute local potentials and AP. All-or-none law.
80. Criteria for excitability. Depolarization threshold. Strength-duration curve.
81. Phenomenon of accommodation in excitable tissues to stimulation. Lability: definition, determining factors, measurement.
82. Sodium-potassium pump. Electrogenic nature of Na-K-pump.
83. Nerve fibers classification. Mechanism and peculiarities of AP propagation along myelinated and unmyelinated fibers.
84. The laws of action potential propagation along nerve fibers and their experimental proving.
85. Neuromuscular junction: structure elements. Mechanism of neuromuscular transmission.
86. Skeletal muscle: motor units and their classification. Physiological properties of skeletal muscles, their functions.
87. Biomechanics of contraction and relaxation of skeletal muscle. The significance of AP, Ca^{2+} ions, troponin, tropomyosin, ATP.
88. Types of muscle contraction, isometric vs. isotonic. Single muscle contraction, factors influencing the strength of contraction.
89. Smooth muscles: importance for organism, properties. Neuromuscular junction in smooth muscle.
90. Integrative role of CNS. Organization of the CNS. Major levels of CNS and their functions.
91. Types of CNS neurons, their structure, physiological properties and functions of neurons
92. Reflex as the principal and specific manifestation of CNS activity. Universal and adaptive character of reflex. Classification of reflexes. Reflex arc.
93. Classification of CNS synapses, neurotransmitters in CNS and their function.
94. Properties of nerve centers, experimental proving, clinical aspects. Methods to study CNS functions.
95. Inhibition process in CNS. Mechanisms of the pre- and postsynaptic inhibition and their various types, significance of inhibition in CNS.
96. Coordination of CNS activity: notion, basic significance, factors of coordination (illustrate with proper examples).
97. Spinal cord role in regulation of body activity: its nerve centers and their significance. Spinal cord transection and spinal shock.
98. Motor functions of the spinal cord; somatic reflexes, their characteristics, classification according to the character of the response. The stepping movement reflex mechanisms.
99. Medulla oblongata and pons: their functions, main reflexes, reflex centers.
100. The midbrain: basic structures and their functions. Static and stato-kinetic reflexes. Substantia nigra and its functions.
101. Reticular formation (RF): structure; localization and connections in CNS; physiological properties and importance, functional of RF neurons. Ascending influences of RF (reticulocortical pathways).
102. Cerebellum: its afferent and efferent pathways. Participation in muscle tone regulation and locomotion control. Symptoms of cerebellar lesions.
103. The diencephalon: its chief structures (thalamus and hypothalamus) and functions.
104. The limbic system: its structures and their interconnections and relations to other structures of CNS.
105. Role of the limbic system in origin of emotions and motivations; in realization of emotional and behavioral adaptive reactions; in memory processes.
106. Neocortex and its functions. Role of primary and secondary somatosensory areas. Motor areas of hemispheres (their locations and functions).

107. Electrical activity in the brain. Brain waves. Electroencephalography.
108. Autonomic nervous system: sympathetic and parasympathetic divisions.
109. Influence of sympathetic and parasympathetic nerves on different organs. Transmission of nerve signals through autonomous ganglia to effector organs (types of receptors, neurotransmitters).
110. Analyzers (sensory systems) by I.P.Pavlov: three divisions and their significance. Sensory organs.
111. Visual analyzer: functions of main eye elements. Mechanisms of eye accommodation in various conditions. Errors of refraction.
112. The conductive and cortical divisions of visual analyzer: visual pathways; organization and function of the visual cortex. Color vision.
113. Auditory analyzer. Role of basic elements. Sound perception mechanisms in various diapason and intensity. Microphone effect of cochlea. Sound source location.
114. Vestibular analyzer. Significance of basic elements in evaluation of body position without and during movements. Role of vestibular analyzer in muscle tone regulation.
115. Tactile and temperature sensations. Nociception; biological role of pain; projected and referred pains.
116. Olfaction analyzer, its structure (receptive part, conductive part, central part). Significance of olfaction to vital process.
117. Taste analyzers, its structure (receptive part, conductive part, central part). Significance of olfaction to vital process.
118. Proprioreception and its role in muscle tone and locomotion regulation.
119. Sensory receptor: notion, function, classification, functional properties; particularities of primary and secondary receptors excitation, regulation of sensory receptor functions.
120. Hormones: nature, classification, principles and physiological peculiarities of action.
121. Main principles (different levels) of endocrine gland function regulation. Scheme of direct and feedback relationships between hypophisis and other endocrine glands.
122. Pituitary gland, parts, hormones secreted. Regulation of secretion.
123. Thyroid gland. Functions of thyroid hormones. Regulation of thyroid hormones secretion.
124. Parathyroid glands. Functions of parathormone.
125. Endocrine function of pancreas. Insulin, glucagon, somatostatin, pancreatic polypeptide.
126. Adrenal cortex, hormones secreted. Regulation of secretion.
127. Significance of grown hormone, thyroid metabolic and sex hormones for physical, mental and genital body development.
128. Male reproductive system. Functions of testis. Regulation of spermatogenesis. Endocrine function of testis. Functions of testosterone in fetal period. Functions of testosterone in adult life.
129. Female reproductive system. Ovarian hormones. Estrogen. Progesterone.
130. Female reproductive system. Changes during menstrual cycle. Ovarian change, follicular and luteal phases, ovulation.
131. Higher nervous activity (HNA): particular role of HNA doctrine in clinical practice. Methods to study HNA.
132. Classification of conditioned reflexes and their characteristics. Conditioned reflexes: mechanism, scheme of the temporary connection. Pavlov’s concept.
133. Inhibition of conditioned reflexes. Different types of inhibition. Role of inhibitory process to learning.
134. Analysis and integrative process in the higher nervous activities. Stereotype cortical activity, its positive and negative aspects.
135. Memory types and mechanisms: sensory, short-term, long-term. Neuronal mechanisms.
136. Pavlov’s theory of HNA types: criteria of general type’s distinctions, methods to type determination.
137. Emotions: definition, classification, influence on body functions, origin and significance. Role of emotional stress in neurosis.

138. Peculiarities of human HNA types. Definition, distinctive features compared with general types. Conscious and subconscious reactions, their significance.
139. Right and left hemisphere functions in integrative brain activity. Signal systems (SS): 1-st and 2-nd human signal systems, their interrelations and significance.
140. Biological rhythmicity. Sleep: definition, cycles, mechanisms, significance, types. EEG distinctions in cycle analysis. Dreams and their provocation factors.
141. Behavior. Brain activity for behavioral processes. Role of the autonomic nervous system in behavior, autonomic supply of behavior.
142. Health state of human's organism. Health promotion. Factor to maintain proper health state.
143. Physiology of labor. Manual labor and creative labor, their influence on the health process.
144. Problem of the hard work and toil. Role of medical staff in prophylaxis of complications after hard work.
145. Capable of working, its types (during shift, diurnal, weekly, monthly, seasonal). Methodic to study capable of working.
146. Fatigue, its mechanisms. Central and peripheral fatigue mechanisms. Fatigue prophylaxis (active and passive relaxation).
147. Adaptation as physiological process. Adaptation to different environmental changes and changes in the inner medium.

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