**Normal Physiology Qs list for exams:**

1. The structure of the cell membrane, role of ion channels, of transport molecules, membrane pumps, membrane receptors. Different types of transport across the cell membrane.

2. Physiologic properties of living cells and of excitable cells: irritability, excitability, conductivity, lability - their quantitative assessment indicators. Comparative assessment of excitable tissue excitability properties.

3. Resting potential and action potential – their ionic origin and characteristics. Action potential’ phases.

4. Phasic changes in excitability of excitable cells during the excitation. Their relative relationship with phases of the action potential.

5. Classification of possible cell stimuli. Laws of excitation: force for a single and for a group of cells/tissue, of relative force and time relationship, of gradient.

6. Classification of nerve fiber structures featuring an excitation along myelinated and unmyelinated fibers. Special features of excitation conduction along various nerve fibers.

7. Neuromuscular synapse. Formation of the “end plate potential”. Special features of the endplate potential compared with the action potential.

8. The intracellular mechanism of skeletal muscle’ contraction. “Sliding filament theory”, the role of calcium ions, regulatory and contractile proteins in muscle contraction. Mechanism of the muscular fiber relaxation.

9. Modes and types of skeletal muscle contractions. Different types of “motor units”. Special physiological features of smooth muscles.

10. Hormonal regulation: hormones, their classification, types of action on cells (metabolic, reactogenic, corrective, etc.). Phases of transport, metabolism, and excretion of hormones from the body/from blood.

11. Hormonal receptions of cellular membrane, special features of steroid and non-steroidal hormones. Role of the “secondary messenger” in a signal transmission of the hormonal regulation.

12. Hypothalamic-pituitary system: activating and inhibiting pituitary hormones, neuro-hormones of the hypothalamus. Hormones of the adenohypophysis , their role in the regulation of body functions.

13. Hypothalamic-neurohypophyseal system. Hormones of the posterior lobe of the pituitary gland. The mechanism of action of vasopressin on renal tubular cells.

14. Hormones of the adrenal cortex and medulla, their effect on metabolism and physiological functions of the body. Regulation of glucocorticoids and mineralcorticoids production and their mode of action.

15. Thyroid hormones, their effect on the metabolism level and other significant body functions. Regulation of formation of iodine-containing hormones. Symptoms of hyper- and hypofunction of the thyroid gland.

16. Endocrine function of the pancreas. Role of pancreatic hormones in the regulation of the body metabolism. General symptoms of insufficiency of endocrine pancreatic function glands.

17. Formation of hunger and satiety feelings. Eating behavior. Hormonal regulation of blood glucose level.

18. Hormonal regulation of calcium metabolism in the body: parathyroid hormones, calcitonin, calcitriol and their functions.

19. Acid-base balance, its physiological indicators. Possible compensational mechanisms in disturbances of acid-base balance. Role of blood buffer systems.

20. Role of the respiratory system, kidneys, other organs in acid-base regulation.

21. Physiological adaptation reactions of the human body. Neuro-endocrine adaptive reactions: sympatho-adrenal reaction, stress reaction, general adaptation syndrome, reaction of an activation and of a training reaction. Natural anti-stress mechanisms.

22. Classification of work activity depending on the intensity of work. Periods of the physical activity process. Mechanisms of development of fatigue during the physical work dynamics.

23. The role of the circulatory, respiratory, blood, thermoregulation systems in ensuring the dynamics of physical work capacity of a person. Special features of a diet, necessary to compensate energy expenditure in working process at different values of the physical activity coefficient.

24. Aging process, theories of aging. Changes in the vegetative body functions during aging.

25. Special features of changes in central and autonomic nervous systems functions during aging. Factors that accelerate and slow down the aging process of the body.

26. Red blood cells: their structure, physiological role, aging and destruction. Physiological erythrocytosis. Regulation of erythropoiesis. Role of erythropoietin.

27. Hemoglobin: its structure and physiological properties. Types of hemoglobin. The role of hemoglobin in blood gas transport and maintaining of constant pH values. Iron metabolism and functions of iron in the human body.

28. Leukocytes, their cell types and peripheral blood content. Redistributional/relative and true leukocytosis. Special features of neutrophilic leukocytes.

29. Special features of basophilic and eosinophilic granulocytes, their functions. Regulation of granulocytopoiesis.

30. Monocytes, macrophages, mononuclear phagocytic cell system, their functions. Regulation of monocytopoiesis.

31. Lymphocytes, their cell types, blood content. Special features of lymphocytes. Regulation of lymphopoiesis.

32. Structure and functions of blood platelets. Vascular and platelet hemostasis stages. Regulation of megakaryocytopoiesis and thrombocytopoiesis, their difference.

33. Coagulation hemostasis and its phases. Special features of external and internal activation pathways of coagulation hemostasis process. Anticoagulant and fibrinolytic systems, their role in maintaining a soluble state of blood coagulation factors and liquid state of the whole blood.

34. Analysis of the cardiac cycle with their periods and phases. Basic indicators of the heart function. Systolic and minute volumes of blood flow in the systemic and pulmonary circulation, normal values of indicators under physiological conditions during rest period and physical activity.

35. Valvular apparatus of the heart. Analysis of the heart valves condition during the cardiac cycle. Heart acoustic tones, their origin and possible significance.

36. Structure and functions of the conduction system of the heart. Automatic features of the heart, the rhythmic excitation origin of the heart. The gradient of the heart automatic excitation ability.

37. Hetero- and homeometric regulation of the heart productivity, intrinsic mechanisms of this type of regulation.

38. The influence of sympathetic and parasympathetic nervous regulation of the heart activity, their mediators.

39. Heart functions reflex regulation. Reflexogenic intracardiac and vascular zones, their involvement in the regulation of heart activity.

40. Linear and volumetric velocities of blood flow in different regions of the bloodstream, their cross-section and individual diameter dependence. Blood circulation time.

41. Special features of blood flow through veins. Blood depots. Role of venous returning volume from the circulation in the regulation of cardiac output.

42. Microcirculation system structure. Factors influencing capillary blood flow intensity. Mechanisms of possible exchange through the capillary wall.

43. Mechanisms of regulation of tissue blood flow. Short-term/short and long-term/delayed phases of this type of regulation during hyperfunction state of organs.

44. Nervous regulation of vascular tone. Vasomotor center. Vasoconstrictor and vasodilator efferent nerves, their mediators.

45. Blood pressure, and main factors determining it. Changes in blood pressure value along the vascular bed. Special features of blood flow in arteries.

46. Main vascular reflexogenic zones, regulation of vascular tone during irritation of baro - and chemoreceptors of these zones. Mechanisms of rapid and long-term regulation of blood pressure.

47. Special features of the coronary blood flow and its regulation.

48. Special features of blood flow in the cortical and medulla layers of kidneys, their crucial role in renal functions and in general redistribution of renal blood flow circulation.

49. Physiology of respiration: general biomechanics of inhalation and exhalation/breathing in – breathing out. Factors determining the elastic properties of the lung tissue. The role of surfactant in pulmonary ventilation.

50. The general view on a gas exchange processes in lungs: the mechanism of gas exchange between intraalveolar volume/alveolar air, blood gases in the pulmonary circulation, intercellular and intracellular fluid gas content/tension. Partial pressure and gas tension in all the mentioned environments.

51. Oxygen gas capacity of blood. The mechanism of gas blood transport for oxygen. Graphic curve oxyhemoglobin dissociation partial analysis.

52. Gas blood transport for carbon dioxide in forms of hydrocarbonate and carbamine. Role of carbonic anhydrase in CO2 blood transport.

53. Respiratory center: dorsal and ventral respiratory neuron groups, and pneumotaxic center. Regulation in breathing changes due to the blood gas content by means of chemoreceptors of reflexogenic zones, by means of mechanoreceptors of the lung tissue and of the upper respiratory tract.

54. Non-respiratory functions of the lungs: mechanisms of the respiratory system protection. Protective reflexes of the respiratory system.

55. Gastrointestinal tract hormones, their role in the regulation of digestive functions.

56. Digestion in the stomach. Content and properties of the gastric juice. Mechanisms of gastric juice secretion regulation. Secretion phases.

57. Pancreatic juice, its composition, role in digestion. Regulation of pancreatic secretion. Secretion phases.

58. Bile-secreting function of the liver. Conditions and mechanisms of bile release into intestines. Role of the bile in digestion. Regulation of bile formation , of bile excretion.

59. Composition, properties of the intestinal juice, its role in digestion. Regulation of secretion. Types of digestion depending on hydrolytic enzymes location.

60. Types of motor activity of various parts of the gastrointestinal tract. Regulation of the motor activity of the gastrointestinal tract.

61. Special features of absorption of nutrients in the gastrointestinal tract. Their mechanisms and types of regulation.

62. Protective functions of various parts of the gastrointestinal tract. Liver as a barrier between the GI and blood systemic circulation. Physiological role of the microflora/microbiota og the GI tract.

63. Principles of the rational balanced nutrition. The role of proteins, fats, carbohydrates, saturated and unsaturated fatty acids, vitamins, vitamin-like substances, minerals, micro- and macroelements for the human body. The role of dietary fiber uptake.

64. Heat production physiological mechanisms: contractile and non-contractile thermogenesis. The primary and the secondary heat. Heat leak physiological mechanisms.

65. Thermoregulation centers. Mechanisms of the heat production and of the heat leak regulation. Special features of the adaptation to cold and heat environment.

66. Stages of the energy release of the organism. Primary and secondary heat. General principles of thermoregulation balancing by means of the heat exchange. Specific dynamic effect of food on energy metabolism. Energy costs for various types of physical activities.

67. Excretory function of kidneys. The mechanism of glomerular filtration. Factors influencing effective filtration pressure values. Starling forces. Comparative content of blood plasma, primary, and secondary urine.

68. Mechanisms of reabsorption of various substances in proximal and distal segments of the nephron – PCT and DCT.

69. Mechanisms of urine concentration in the loop of Henle.

70. Method of red blood cells count in the Goryaev chamber. Normal quantities of erythrocytes/RBC in peripheral blood.

71. Methods for evaluating the hemoglobin amount in peripheral blood. Normal hemoglobin amount in peripheral blood. Color index and its significance in diagnostics of anaemias.

72. Method of counting leukocytes in the Goryaev chamber. Normal white blood cell count in peripheral blood. Leukocyte formula of human blood, CBC – complete blood count, method of its determination.

73. Method of the hematocrit determining. Normal hematocrit values and significance in diagnostics.

74. Method of the osmotic resistance determining of erythrocyte membranes. Normal values of minimum and maximum osmotic s resistance of erythrocytes.

75. Determination of erythrocyte sedimentation rate ESR by Panchenkov method. Normal ESR values

and its significance for diagnostics.

76. Electrocardiography: 12-lead electrodes application to register biopotentials. Electrocardiogram analysis. The significance of electrocardiography in diagnostics of cardiac activity: conductive cardiac system and cardiomyocytes.

77. Methods for assessing the influence of the autonomic nervous system on heart activity: ortho -, clinostatic tests, Danini-Aschner oculocardiac reflex, Ortner's test, Kerdo vegetative/autonomous nervous system index. Their significance for diagnostics.

78. Direct and indirect methods for measuring arterial blood pressure ABP, Korotkov method. Normal values of systolic, diastolic, pulse pressure, mean arterial blood pressure and their significance for diagnostics.

79. Spirography and spirometry: static volumes and lung capacities, their normal values. Dynamic lung respiration volumes, maximum voluntary ventilation value, forced vital capacity of lungs, their normal parameters and clinical significance for diagnostics.

80. Energy metabolic rate determination during complete gas analysis of exhaled air.

81. Determination of energy metabolic rate with incomplete gas analysis of exhaled air.

82. Determination of energy metabolic rate during direct calorimetry. Methods of calculating the due basal metabolic rate BMR values. Total metabolic rate and its values in various states of the organism.

83. Basic requirements for rational balanced daily diet. Nutrient and their variations depending on age, physical activity, health status, and body composition: proteins-fats-carbohydrates. Supplements. Diet glycemic index.

84. Principles of filtration, reabsorption , secretion, and plasma flow values measuring in kidneys. Coefficient of blood clearance.

85. Methods of visual acuity, color perception, refraction errors, visual fields, binocular 3D vision parameters evaluation and their diagnostic significance.

86. Methods of the auditory system/analyzer parameters evaluation: test of Rinne , Weber test.

87. Methods of the taste analyzer assessment: the thresholds of taste perception estimation.

88. Methods of assessing the general physical performance: test PWC170, test HST, aerobic capacity of the organism of athletes.