

Examination Synopsis 2023

1. The human body. Homeostasis. General principles of the homeostatic regulation – types of regulatory systems and elements of the homeostatic regulatory system. Levels of physiological regulation.
2. Physiology of the excitatory tissues. Irritability and Excitability. General and specific properties of the excitable cells. Membrane potential – ionic basis of the membrane potentials. Measurement of excitability. Changes in the excitability during excitation. Inhibition. Conduction of the excitation.
3. Transmission of the excitation (inhibition) from an excitable cell to another. Synapses - types of synapses. Chemical synapses. Transmitters and modulators. Postsynaptic potentials. Summation of the postsynaptic potentials.
4. Functions of the nervous system – functional morphology of the nervous system. Physiology of the nerve cell. Neuronal circuits and processing of information form group of nerve cells – convergence, divergence, reverberating circuits, inhibition.
5. Reflex regulation of the physiological functions. Type of reflexes according to the mechanism of formation and the characteristics of the involved reflex arc. Nerve centers. Types and properties. Cerebrospinal fluid.
6. The autonomic nervous system. General organization of the autonomic nervous system. Autonomic nerve centers, ganglia, transmitters and receptors in the autonomic nervous system. Effects of autonomic nervous system on specific organs and systems. Integration of the central nervous system in the adaptation processes of the body – the sympathetic –adrenal system.
7. General principles of the humoral control of the physiologic functions. Telecrinia and paracrinia. Classification, synthesis and mechanism of action of the hormones. Control on the hormone secretion.
8. Hypothalamic-neurohypophysial system. Neurosecretion. Hormones of the neurohypophysis. Physiologic effects and control of secretion. Hypothalamo-adenohypophysial system. Hormones of the adenohypophysis. Physiologic effects and control of secretion.
9. Functional morphology of the thyroid gland. Iodine containing thyroid hormones. Physiologic effects and control of secretion. Changes in the organism during abnormalities of thyroid functions.
10. Functional morphology of adrenal glands. Hormones of the adrenal medulla. Physiologic effects and control of secretion of adrenaline (epinephrine) and noradrenaline (norepinephrine).
11. Hormones of adrenal cortex. Glucocorticoids - physiologic effects and control of secretion. Pharmacologic effects of glucocorticoids. Mineralcorticoids and adrenal androgens - physiologic effects and control of secretion.
12. Endocrine functions of the pancreas – type of hormones, physiologic effects and control of secretion. Changes in the organism during abnormalities of endocrine pancreatic functions.
13. Calcium-phosphate homeostasis. Parathyroid hormone, calcitonin, calcitriol - physiologic effects and control of secretion. Impairment of the calcium and phosphate

homeostasis.

14. Hormonal activity of the testes. Androgens – types, physiologic effects and control of secretion. Hormonal activity of the ovaries. Estrogens and progesterone – physiologic effects and control of secretion. Menstrual cycle. Tests for early pregnancy and ovulation.
15. Physiology of skeletal muscles – functional morphology, mechanism and energetic of muscle contraction. Types of muscle contractions. Types of muscle fibers. Muscle fatigue.
16. Functional morphology of smooth muscles. Excitation, electrophysiologic characteristics and mechanism of contraction of smooth muscles.
17. Blood and lymph. Functions of the blood. Composition and volume of the circulating blood – regulation of the volume. Blood plasma – composition and its regulation. Hematocrit. Blood reservoirs. Formation, composition and functions of lymph.
18. Erythrocytes. Count and functions. Erythrocyte sedimentation rate. Hemoglobin. Iron metabolism. Hemolysis. Control of erythropoiesis and erythrocyte count in the bloodstream.
19. Blood types. Physiological and clinical significance. ABO and Rh blood type systems. Methods of analysis. Principles of blood transfusion.
20. Leukocytes. Count and functions of the different leukocyte types. Control of leukopoiesis and leukocyte count in the bloodstream. Immunity.
21. Hemostasis and hemocoagulation. Vascular-trombocyte and coagulation hemostasis. Fibrinolysis and anticoagulational mechanisms. Control of hemostasis.
22. Physiology of respiration. External respiration. Functional organization of the airways, lungs and thoracic basket. Mechanics of breathing. Intrapleural and intrathoracic pressure. Role of surfactant. Defense reflexes – cough and sneeze.
23. Rate and rhythm of breathing. Pulmonary and alveolar ventilation. Static lung volumes and capacities and their functional concern. Anatomic and physiologic dead space.
24. Physical basis of gas exchange. Solubility, diffusion coefficient and diffusion capacity of the gases. Composition of the gases in air, lungs and blood. Diffusion of gases across the alveolocapillary membrane. Ventilation-perfusion ratio.
25. Transport of O₂ in the blood. Oxyhemoglobin dissociation curves. Oxygen exchange in lungs and tissues. Transport of CO₂ in the blood. Carbon dioxide exchange in lungs and tissues.
26. Control of respiration. Respiratory center and rhythm of breathing. Chemical control of respiration. Reflex control of respiration. Effects of the cerebral cortex on the respiratory functions.
27. Cardiovascular system. Systemic and pulmonary circulation. Heart as an organ – functional morphology of the pericardium, endocardium and myocardium. Nerve supply. Myocardial blood supply.
28. Functional morphology and physiological characteristics of the excitatory and conductive system of the heart. Automaticity. Cardiac rhythm. Abnormalities of conductivity.

29. Physiological characteristics of the working myocardium. Excitation and contraction. Refractory periods. Extrasystoles, flutter and fibrillation. Myocardial metabolism. Bioelectrical activity of the heart.
30. Dynamics of the cardiac contractions – cardiac cycle. States of the valvular apparatus during different phases of the cardiac cycle. Functions of the heart valves. Heart sounds.
31. Heart rate. Stroke volume and cardiac output and their changes during different physiological conditions.
32. Control of the cardiac performance – intrinsic (self-control). Extracardial neural regulation of the cardiac performance. Humoral factors affecting cardiac performance.
33. Functional characteristics of blood vessels. Hemodynamic principles – characteristics of the vessels and the blood. Hemodynamic indices. Volume and linear velocity of the blood flow through the various parts of vascular system and factors determining them.
34. Blood pressure in the various parts of the cardiovascular system. Arterial blood pressure – methods of measurements and normal values. Factors determining the blood pressure levels.
35. Arterial blood flow. Arterial pulse. Sphygmography. Venous blood flow. Venous pulse. Phlebography.
36. Physiology of the microcirculation. Functional organization of the microcirculation unit. Control of the microcirculation.
37. Vascular tone. Basal tone of blood vessels. Local, neural and humoral regulatory mechanisms of the vascular tone.
38. Control of the circulation. Characteristic and localization of the receptors. Vasomotor center. Supramedullary control of the circulation. Control of the arterial blood pressure. Mechanisms of the quick short-term, quick ongoing, and long-term regulation.
39. Gastrointestinal system – functions. Digestion in the Mouth: processes of mastication, secretion, enzyme destruction and absorption. Swallowing – phases and regulation.
40. Motor functions of the Stomach. Hunger contractions, storage function, mixing and propulsion of food. Emptying of the Stomach. Control of the Stomach motor activity. Vomiting.
41. Secretion, enzyme destruction and absorption in the Stomach. Gastric juice: composition, mechanism of secretion and functions. Gastric secretion and its control: cephalic, gastric and intestinal phases. Protective potentialities of the gastric barrier.
42. Small Intestine – motor activity: type of movements and regulation; secretion, digestion and absorption. Colon – type of movements and their regulation; secretion, digestion and absorption. Defecation.
43. Pancreatic juice – composition and functions. Control of the pancreatic secretion. Processes of formation and secretion of bile. Volume, composition and functions of the bile. Regulation of the bile secretion.
44. Energy metabolism in the organism. Energy values of the nutrients. The energy equivalent of oxygen. The measurement of the metabolic rate: direct and indirect calorimetry. The basal metabolic rate and the daily energy requirements for different physiologic states.

45. Nutrition: main principles in defining the physiologic standards– plastic and energy needs of the organism. Physiologic mechanisms of hunger and satiety.
46. Temperature regulation. Body temperature and isothermia. Mechanisms of heat production and heat loss. Neurophysiologic bases of temperature regulation. Hyperthermia and hypothermia. Acclimatization.
47. Excretion functions of the organism and systems, accomplishing them. The kidneys – functional structure. Specific features of the kidneys blood supply and innervation. Functions of the glomerulus. Mechanism and control of glomerular filtration
48. Functions of renal tubules. Transport processes within the different parts of the tubules. Mechanisms for excretion of a dilute urine and a concentrated urine. Renal excretion.
49. Renal clearance tests. Volume of the urine and its components. Micturition. Endocrine and metabolic functions of the kidneys. Control of the renal functions.
50. Water-electrolyte balance of the organism. Dynamics of body fluids volume and osmolality. Control of Water-Salts homeostasis. Thirst – physiologic mechanisms. Acid-Base Balance of the organism and regulation of pH.
51. Sensory systems. Functional morphology. Sensory systems adaptation. General sensation. Somatosensory system – organization and modalities. Mechanisms of thermo- and mechanoreception. Pain sensation. Itch.
52. Vision sensory system. Functional morphology of the eye – the optics of the eye; the mechanism of accommodation; errors of refraction. The pupillary reflex. Eyes movements. Detection, transmission and processing of the information in the retina. Central neurophysiology of vision. Light and dark adaptation. Visual acuity. Colour vision.
53. The sense of hearing. Functional morphology of the external, middle and inner ear. Processing of the sound signal. Central auditory mechanisms. Vestibular apparatus. Central mechanisms of the maintenance of equilibrium.
54. Physiology of the chemical senses - taste and smell. Peripheral and central mechanisms of taste and smell sensations.
55. States of brain activity and sleep. Physiologic changes within sleep. Electroencephalography.
56. Higher nerve activity – types and characteristics. Learning and memory: types and physiologic bases. Primary and secondary signalling systems. Communication skills. Reading, writing and speech praxis. Auditory and visual gnosis.