NORMAL PHYSIOLOGY

1st semester

SEMINARS QUESTIONS

L*iterature recommended:* Guyton & Hall "Textbook Of Medical Physiology"

Seminar 1. Physiology of excitable systems

1. The structure of the cell membrane of excitable cells, main functions. Ion channels, classification and physiological role. The mechanisms of activation of ion channels (ligand-gated, voltage-gated, mechanosensitive).

2. Characterization of intra- and extracellular fluid of excitable cells. The transport across the cell membrane. Ion pumps, their varieties. Primary and secondary active transport. The ionotropic and metabotropic receptors of the cell membrane.

3. Excitability. The membrane potential. Factors of its appearance and maintenance. Parameters of excitability: threshold of irritation, chronaxia, rheobase, lability.

4. The action potential, ionic mechanisms of its occurrence. The analysis of phases of action potential. Refractory period, its phases (absolute and relative). The mechanisms and physiological significance of sodium inactivation. "All-or-none" principle.

5. Local response, mechanism of its occurrence. Comparison of the local response to the properties of the action potential.

6. Propagation of excitation in the myelinated and unmyelinated nerve fibers. Classification of nerve fibers according to the speed of conduction and diameter. Principles of conduction of excitation along the nerve fibers.

7. Chemical and electrical synapses. Conduction of excitation in the neuromuscular junction. The structure of the synapse. Exocytosis of the synaptic vesicles. Activation of nicotinic acetylcholine receptors of the postsynaptic membrane. The role of acetylcholinesterase. End-plate potentials and generation of action potential in the muscle fiber.

8. Pre- and postsynaptic mechanisms of physiologically active substances and pharmaceutical drugs action on the neuromuscular transmission. Decreasing of the neuromuscular transmission during fatigue.

9. Types of muscle fibers. The structure of myofibrils as a functional unit of the muscle fiber. The mechanism of muscle contraction in striated muscle sarcomere. The sliding filament theory.

10. Role of calcium ions and ATP in muscle contraction. Excitation-contraction coupling. The process of muscle relaxation. Rigor mortis.

11. Simple twitch, summation of contractions and tetanus (complete and incomplete). Tonic muscle contraction. Energy of muscle contraction. Phasic and tonic muscle fibers. Features of functioning and metabolism of oxidative and glycolytic fibers.

12. The concept of the motor unit. Regulation of the muscle strength. The development of fatigue in the body, in neuromuscular preparation and in individual muscles (central and peripheral fatigue).

13. Structure, innervations and contraction of smooth muscles. Spontaneous contractions of smooth muscle and its mechanism. Single-unit (unitary) and multiunit smooth muscles.

Seminar 2. Central Nervous System

1. Basic types and functions of neuronal and glial cells. The blood-brain barrier, mechanisms and functions. Central synapses. Neurotransmitters in the CNS. EPSP and IPSP. Pre- and postsynaptic inhibition. The phenomenon of summation - temporal and spatial summation.

2. The properties and characteristics of the excitation propagation in the neuronal networks: divergence, convergence, potentiation, occlusion, accomodation. The principle of convergence (final common pathway). Inhibition in the CNS (I.M.Sechenov), its types and role. Modern understanding of the mechanisms of central inhibition. Reciprocal, lateral, Renshaw's inhibition. The concept of the nerve centre, its properties.

3. Reflex as a general principle of regulation of body functions. The reflex arc and its components. Classification of the reflexes: somatic/autonomic reflexes; mono-/ polysynaptic reflexes.

4. Spinal cord. Motor function of the spinal cord. Afferent proprioceptive system. Extrafusal and intrafusal fibers. The concept of the gamma loop (role of gamma motor neurons). Regulation of muscle tone. The tendon reflexes, Jendrassik maneuver. Somatic polysynaptic reflexes (flexor, extensor). Automatic programs of spinal cord (walking, running). Spinal autonomic reflexes. Transmission of information by the spinal cord.

5. Motor function of the brain stem. Static and statokinetic reflexes. Motor nucleus of the brain stem: red, vestibular, reticular formation nuclei. Functions of red nuclei, their influence on the alpha and gamma motor neurons of the spinal cord. Decerebrate rigidity. Postural reflexes of the brain stem. The most important autonomic reflexes of the medulla oblongata. Visual and auditory orientation reflexes.

6. Reticular formation, its structure and function of neural organization. Reticular neurons. Polysensoric reticular neurons. Reticular activating system.

7. The cerebellum and its basic functions. Afferent and efferent pathways of cerebellum (connections with other departments of the central nervous system). The consequences of the

removal of the cerebellum. Symptoms resulting from the failure of the cerebellum and their causes.

8. Diencephalon. The thalamus as a collector of sensitive information. The nuclei of the thalamus. Hypothalamus and its functions. Characteristics of neurons and hypothalamic nuclei.

9. The basal nuclei. The role of the basal ganglia in the coordination of motor activity. The functions of the substantia nigra, its connection to the basal nuclei. Parkinson's disease. Huntington's disease.

10. The limbic system, its structure, and its basic physiological functions.

11. The cerebral cortex of the brain, its structure. The cellular structure of the cortex (layers and types of neurons). Representation of functions in the cortex. Sensory, motor and associative areas. Localization of functions in the cerebral cortex. Motor areas of the cerebral cortex. The role of the pyramid and extrapyramid systems in the organization of motor acts.

12. Sympathetic and parasympathetic divisions of the autonomic nervous system, their characteristics. Neurotransmitters of the sympathetic and parasympathetic systems. The mechanism of action of neurotransmitters of the sympathetic and parasympathetic divisions on various receptors. Autonomic reflexes and centers of regulation of vegetative functions.

Seminar 3. Physiology of sensory systems, part 1

1. Sensory systems: their structure and physiological significance. Information coding in the sensory systems. The concept of sensation. General properties of receptors. Classification of the sensory receptors and their types. Primary and secondary sensory receptor cells.

2. The mechanism of the receptors excitation. The receptor and generation potentials. Adaptation of the receptors.

3. Visual system. The optical system of the eye. Blind Spot. The pupil and the pupillary reflex. Accommodation of the eye. Refractive abnormalities of the eye (nearsightedness, farsightedness, astigmatism). Presbyopia.

4. The structure of the retina. Photoreceptors (rods and cones). Photochemical reactions in the receptors of the retina.

5. Receptive fields of neurons in the visual system. The dark and light adaptation.

6. Color vision. Theories of color perception. Color blindness.

7. The motor apparatus of the eye. The temporal characteristics of eye movements (saccades, fixation periods and smooth motion).

8. Processing of visual information in the thalamus. The transformation of the visual sensory stimulation in the thalamus. Analysis of visual sensory stimulation of the visual cortex neurons.

9. Auditory system. Structure and function of the outer, middle and inner ear. The organ of Corti, its structure and mechanism of excitation.

10. The perception of sounds of different frequencies. The mechanism of genesis of receptor potential in the hair cells of the spiral ganglion. Conduction and analysis of sound in the CNS.

Seminar 4. Physiology of sensory systems, part 2

1. The vestibular system. Natural stimuli for the otolith apparatus and the semicircular canals. The mechanism of genesis of receptor potential in the hair cells in the vestibular receptors.

2. The central part of the vestibular system, the maintenance of balance. Vestibular reflexes, nystagmus.

3. Olfactory system. Olfactory adaptation. The sensitivity of the receptors to different kinds of smells. Central processing of olfactory information.

4. Taste system. Taste adaptation. The sensitivity of the receptors to different kinds of taste stimuli (salty, sweet, sour and bitter). Central processing of taste information.

5. Somato-visceral sensitivity. Classification of afferent nerve fibers, receptor structures, types of sensitivity. Cutaneous mechanoreceptors, their classification, functional significance. Afferent innervation of the skin and inner organs, their receptive fields.

6. Proprioception (muscle spindles, Golgi tendon receptors, joint receptors). Classification of proprioceptors, innervation. Central integration of proprioceptive stimuli. Body scheme.

7. Thermoreception. The sensation of heat and cold. Adaptation mechanisms in thermoreception. TRPV and TRPM receptors.

8. Nociception. Types and qualities of pain. Painful stimuli, adaptation to pain. Neurophysiological basis of pain: the theory of pain perception. Nociceptors and their innervation. Neurotransmitters of pain and antinociceptive system.

9. Processing of Sensory Information in the CNS. Levels of processing of sensory information, specific and nonspecific sensory system (dorsal column–medial lemniscal system and anterolateral pathways). Afferent connections in the spinal cord.

10. Somatosensory function of the brain stem, the role of the reticular formation. Specific and non-specific thalamic nuclei. Somatosensory cortical areas and their projection of the body.

Seminar 5. Physiology of cognitive functions

1. The subject of physiology of cognitive functions, relationship with psychology. Contribution of works of I.M. Sechenov and I.P. Pavlov to the physiology of cognitive functions. The types of cognitive functions their classification.

2. Correspondence between types of temperaments and the parameters of the nervous system (Pavlov's theory: classification by nervous system's strength, mobility and stability). The properties of the nervous system and personality. Temperament in the structure of personality. Extraverts and introverts.

3. Basic principles of the reflex theory. Hereditarily fixed forms of behavior (instincts). General characteristics of the conditioned reflex. Rules of formation of conditioned reflexes. Classification of conditioned reflexes. Classical and instrumental conditioning.

4. Inhibition of conditioned reflexes. External and internal inhibition. Hypotheses to explain these processes. Interaction of various types of inhibition.

5. Habituation and sensitization as a stimuli-dependent training. Its mechanisms.

6. Neurophysiological features of the memory. Short-term memory organization. Structural and functional basis of memory and learning. Cellular and molecular mechanisms of memory and learning.

7. Temporary organization of memory, types of memory. Hypotheses to explain the mechanisms of memory. Types of amnesia.

8. The role of the dominant formation (by Uchtomsky) in conditioning. The dynamics of the existence of a dominant. Features of the dominant center (by Ukhtomsky). Factors contributing to the emergence of dominant.

9. Motivation. Biological motivation. General properties of different types of motivation. Motivation as a dominant.

10. Features of the human brain cognitive functions. Speech and its functions. The development of speech in the childhood. Speech function in different hemispheres.

11. Types of sleep, its importance. Slow and REM sleep. Transition states. Hypotheses of sleep forming. Sleep disorders.

12. General characteristics of emotions. Limbic system functions. The role and functions of emotions. Vegetative (autonomic) reactions associated with emotional state.

13. Stress. The role of stress. Eustress and distress. Stages and physiology of the stress reaction. The development of the stress response.

14. The structure of the behavioral act. A functional system by Anokhin P.K. Stages of behavioral act.

2nd semester

SEMINARS QUESTIONS

Seminar 1

Cardiovascular Physiology - Part 1

1. The structure of the human heart. The role of the heart in the circulatory system. Pulmonary and systemic circulation. Physiological parameters of the heart.
2. Cardiac cycle, characteristics of different phases of the cardiac cycle, and their duration. The change of pressure in different parts of the heart during different phases of the cardiac cycle.
3. The typical and atypical (modified, pacemaker) cardiomyocytes. Autorhythmicity of the heart. Characteristics of the conducting system. Ionic mechanisms of the action potential in pacemaker cardiomyocytes. HCN-channels role in the generation of pacemaker potentials.
4. Morphological and physiological characteristics of the typical cardiomyocytes. Analysis of typical cardiomyocyte action potential phases. Refractory period of the heart muscle, its phases. The physiological role of the refractory period.
5. The conduction velocity of excitation in different parts of the heart. Atrioventricular delay and its role in the cardiac cycle.
6. Excitation-contraction coupling in the heart muscle. The role of calcium in the mechanisms of contraction of cardiomyocytes. Sources of calcium ions. Extrasystoles and their types. The mechanisms of compensatory pause after ventricular extrasystole.
7. Effects of the parasympathetic nervous system on heart function. The nature of the effects of the vagus nerves (chrono-, ino-, and dromotropic) on cardiac function. The receptor mechanisms of action of the parasympathetic neurotransmitters, types of cholinoreceptors. The tone of the vagus nerve center, its significance.
8. Influence of the sympathetic nervous system on the heart (chrono-, ino-, and dromotropic effects). The nature of the effects of the sympathetic nerves and their neurotransmitters on the parameters of the cardiac contraction, types of adrenoreceptors.
9. Intracardiac mechanisms of regulation of cardiac activity. Frank-Starling law and staircase phenomenon as mechanisms of self-regulation of the heart muscle, their significance. Intracardiac reflex arcs, characteristic of cardiac neurons. The role of the stretch receptors in the atria and ventricles in regulation of contractile function of the heart.
10. Extracardiac reflex mechanisms of regulation of the heart work. The role of vascular reflex zones (aortic arch, carotid sinus) in the implementation of the cardiac reflexes. The role of other receptors (pain, temperature, light, etc.) in the regulation of the heart work. Reflexes of Goltz, oculocardiac (Dagnini-Aschner) reflex, their importance in the clinics.

11. Nervous regulation of cardiac activity. The role of the centers of the medulla oblongata and the hypothalamus in the regulation of the heart functioning. The role of the limbic system and cerebral cortex in the mechanisms of heart adaptation to internal and external stimuli.
12. Humoral regulation of cardiac activity. The mechanism of action of the hormones and metabolic factors on the cardiomyocytes (adrenalin, acetylcholine, thyroid hormones, etc.). The role of the electrolytes (Ca, K, H^+ and phosphates) in the heart function. The endocrine function of the heart.
13. Electrocardiography. The mechanisms of ECG waves formation, their analysis and interpretation.
14. Phonocardiography. Heart sounds and their origin. Mechanisms of heart murmur formation. Age-related changes of cardiac activity from the neonatal period to old age.

Seminar 2

Cardiovascular Physiology - Part 2

1. Morpho-functional classification of the blood vessels. The main hemodynamic parameters (pressure, flow and resistance). Poiseuille Law. The nature of the movement of blood through the vessels, its features: laminar and turbulent blood flow in different parts of the vascular system. Factors responsible for continuity of blood flow.
2. Blood pressure, its values in different areas of the vascular system.. Factors determining the blood pressure value. Regular fluctuations in blood pressure (1,2,3-degree waves or deflections), their origin.
3. Characteristics of systolic, diastolic, and pulse pressure. The concept of average pressure. Age-related blood pressure characteristics.
4. Arterial pulse. The mechanism of its occurrence. The velocity of pulse wave propagation, its registration methods. Analysis of sphygmomanometry. Quantitative and qualitative characteristics of the arterial pulse.
5. Venous pressure, its characteristics. Features of the movement of blood through the veins. Factors that ensure venous return of blood to the heart.
6. Microcirculatory bed. Classification of capillaries. Characteristics of metabolic processes occurring in the capillaries. Participation of the capillaries in the formation of intercellular fluid. Factors that provide filtering mechanisms, reabsorption. The regulation of capillary blood flow.
7. The lymphatic system. Mechanism of lymph formation. The composition of the lymph. The role of the lymph nodes. Factors determining the movement of lymph. Regulation of lymph circulation.

8. Local mechanisms of regulation of circulation. The role of the vascular endothelium in the regulation of local circulation.
9. The central mechanisms of regulation of circulation. Vasomotor center, its departments. Vasoconstriction innervation. Tonus of vasoconstrictor nerves. Neurogenic and myogenic components of the vascular tone, their nature. The mechanism of the effect of the sympathetic neurotransmitters to the vascular smooth muscle cells.
10. The effect of the parasympathetic neurotransmitters on the vascular smooth muscle cells, its mechanisms. Humoral regulation of the vascular tone.
11. Reflex regulation of the blood pressure. The role of the vascular reflex zones. Pression and depression reflexes. The role of baro- and chemoreceptors.
12. A functional system that provides maintenance of constant blood pressure in the body. The role of the cardiac and vascular reflexes, vascular redistribution reactions. CNS departments involved in the regulation of blood pressure (spinal, bulbar, hypothalamic, cortical levels), their characteristics.

Seminar 3

Physiology of Respiration

1. The exchange of gasses between the lungs and the blood. Tissue gas exchange, dissolving gasses in the plasma and formed elements, the transport of O_2 and CO_2.
2. External respiration. Mechanics of inspiration and expiration. The role of the inspiratory and expiratory muscles. Forced breathing. Types of breathing. Functions of the respiratory passageways.
3. The pleural space, its significance. The negative pressure in the pleural cavity, its causes. Changes of the pleural pressure during inhaling and exhaling. Pneumothorax. The elastic properties of the lung, thorax, and abdomen. The role of the surfactant and tissue factors.
4. Pulmonary and alveolar ventilation. The anatomical and alveolar dead space. Pulmonary volumes and capacities: respiratory capacity, reserve volume of inhalation and exhalation, the vital lung capacity, residual volume, respiratory rate, minute respiratory volume at rest and during exercise. Methods for determination of respiratory volumes. Pneumatogram.
5. Types of hemoglobin. Transport of oxygen in the blood. Oxyhaemoglobin dissociation curve, the factors influencing the process of dissociation. Partial pressure of O_2 in arterial and venous blood at rest and during physical exercises.
6. Transport of carbon dioxide in the blood. Transport of carbon dioxide in solution. The carbonic anhydrase role. Formation and dissociation of carbon hemoglobin bicarbonates in the blood. The partial pressure of carbon dioxide in arterial and venous blood.

7. Regulation of respiration. The role of peripheral lung receptors (stretch, irritant, capillary) in the self-regulation of breathing. Hering-Breuer reflex.
8. The role of the peripheral and central chemoreceptors in the regulation of respiration. Effects of hypoxemia and hypercapnia on breathing. The role of the vagus nerve.
9. Respiratory center, its location. Inspiratory and expiratory neurons. Pneumotaxic center. The role of the pons as a regulator of the duration of inhalation and exhalation acts.
10. The role of the hypothalamus, limbic system, cerebral cortex in the regulation of respiration. Conditioned reflex and the voluntary regulation of breathing.

Seminar 4
Physiology of Digestion

1. The main functions of the digestive system. Centers of hunger and satiety in hypothalamus, its organization and role in regulation of appetite, hunger, and satiety.
2. Digestion in the mouth. Types of salivary glands. The composition of saliva. Regulation of the quantity and composition of the saliva.
3. Digestion in the stomach. Gastric glands. The amount and composition of the gastric juice. Enzymes of gastric juice. Role of hydrochloric acid. Gastric mucus and its significance. Features of gastric secretion on various kinds of food.
4. Phases of gastric secretion, their characteristics. Humoral regulation of gastric secretion (acetylcholine, histamine, gastrin, secretin). The transition of chyme from the stomach into the duodenum. Enterogastric reflex. The role of hydrochloric acid and secretin. Factors that accelerate and slow down the evacuation of the stomach contents.
5. Digestion in the duodenum. Pancreatic juice, its quantity, and composition. Pancreatic juice enzymes and their role in the digestion of proteins, fats, and carbohydrates. Activation of the enzymes of pancreatic juice, the role of the enterokinase. Regulation of pancreatic secretion. Influence of vagus nerves. The role of the digestive tract hormones.
6. The physiology of the liver. The main functions of the liver. Bile Formation, its quantity, and composition. Regulation of bile formation, the role of bile in the digestive system. Biliary excretion and its mechanisms. Regulation of biliary excretion.
7. Digestion in the small intestine. The composition of the intestinal juice. Regulation of intestinal secretion. The functions of the large intestine. Formation of feces. The role of the microflora.
8. Digestion of proteins, carbohydrates and fats in different parts of the gastrointestinal tract. Mechanisms of absorption of proteins: passive and active transport. Amino acids transport system. Mechanisms of absorption of carbohydrates and fats.

9. Absorption of vitamins, water, minerals, and microelements in the digestive tract. The mechanisms of its absorption and regulation of these mechanisms.
10. Gastric and intestinal motility. Types of peristaltic movements and their significance for the mixing and the propulsion of food. Influence of vagus nerve, intramural ganglia and digestive tract hormones.
11. The act of defecation. The functioning of the internal and external sphincters of the rectum. Reflex regulation of defecation.

Physiology of Metabolism and Thermoregulation

12. The body's metabolism, the concept of anabolism and catabolism. Basal metabolic rate. Rules and methods of determining the value of basal metabolic rate. Direct and indirect calorimetry. “Surface law” of metabolic rate by Rubner. Energy consumption for different types of physical and mental labor. Energy expenditure. Energy expenditure during various activities.
13. Normal food intake. Caloric value of nutrients. The digestibility of the food. Protein metabolism and its regulation. The biological value of the proteins, their participation in a balanced diet. The nitrogen balance.
14. Carbohydrate metabolism, its regulation. Glucose levels in the blood for the body. Exchange of mineral salts and water.
15. Exchange of fat, its regulation. Fats of animal and vegetable origin, their role in fat metabolism.
16. Human body temperature, its daily fluctuations. Chemical and physical thermoregulation. Mechanisms of maintenance of a constant internal environment of the body temperature. Thermoregulatory centers.

Seminar 5

Physiology of Excretion

1. Excretory organs (kidney, skin, lungs, digestive tract), their involvement in maintaining the critical parameters of the internal environment.
2. Kidney, its functions. Nephron as a morpho-functional unit of the kidney, its structure. Types of nephrons, their function. Juxtaglomerular complex, its role.
3. Blood circulation in the kidney. Features of the blood circulation of the cortical and medullary kidney substances. Self-regulation of renal blood flow.
4. The mechanism of formation of primary urine, its composition and quantity. Effective filtration pressure. Glomerular filtration rate, factors affecting it. The permeability of the glomerular capsule for different substances.

5. Mechanisms of osmotic dilution and osmotic concentration of urine (countercurrent system). Role of osmotically active substances in urine concentration (salts, proteins, H^+).
6. Tubular reabsorption. The mechanism of selective reabsorption of substances in different parts of the nephron. Types of transport. The role of transporters. Tubular secretion and its mechanism.
7. The role of the nervous system and hormones in the regulation of urine formation (antidiuretic hormone, aldosterone, catecholamines, natriuretic hormone, calcitonin, parathyroid hormone, renin-angiotensin system, etc.).
8. The processes of urine formation and urination, and their regulation. The composition, properties and quantity of the final urine.
9. Micturition process and its regulation. The role of the kidneys in maintaining nitrogen balance, osmotic pressure, pH, blood volume in the organism.

Seminar 6

Physiology of Blood

1. Composition and Functions of blood. Physico-chemical characteristics of blood, the blood buffer systems. Hematocrit.
2. The blood plasma. The concept of osmotic pressure. Hypo-, iso-, hypertonic solutions. Composition and functions of blood plasma. Plasma proteins and their functions.
3. Formed elements of blood. Formation, lifespan and the destruction of blood cells, erythropoiesis, leucopoiesis, thrombocytopoiesis. External and internal factors of hematopoiesis. Nervous and humoral mechanisms of regulation of hematopoiesis.
4. Red blood cells (RBC, erythrocytes). Shape and size of red blood cells. Functions of erythrocytes. Polycythemia, erythropenia. Osmotic resistance of erythrocytes. Erythrocyte sedimentation rate.
5. Hemoglobin. Hemoglobin function and structure. Iron Metabolism.
6. RBC formation and life span. Genesis of Blood Cells. Production of RBC. Regulation of Erythropoiesis. Role of Erythropoietin. Anemias.
7. Structure and types of White Blood Cells (leukocytes). Genesis of the White Blood Cells.
8. Functions of the various types of leukocytes. Inflammation: Role of Neutrophils and Macrophages. Phagocytosis. Leukopenia. Types of Leukemia.
9. Non-specific (innate) immunity: humoral and cellular. Specific (acquired) immunity. Lymphocytes, their types. Role in cellular and humoral immunity. Preprocessing of the T and B-lymphocytes. Different types of T and B lymphocytes and their functions. Immunoglobulins and their functions. Mechanisms of cellular and humoral immunity.
10. Platelets, their physiological role and production. Hemostasis and blood coagulation. Platelet hemostatic factors. Clot formation. Primary (vascular and platelet) hemostasis, its characteristics.

11. Secondary hemostasis hemocoagulation. Plasma clotting factors. Phases of coagulation. Intrinsic and extrinsic pathways. The retraction of a blood clot. Fibrinolysis, its phases. The relationship of blood coagulation and anticoagulation systems. Natural anticoagulants. The regulation of blood coagulation. Thromboembolic and bleeding disorders.
12. Blood groups. ABO system. Rh factor. Agglutinins and agglutinogens. Agglutination of red blood cells. Rules of blood transfusion. The mechanism of Rh-conflict. Inheritance of blood groups.

Seminar 7

Physiology of Endocrinology and Reproduction

1. The functional significance of the hormones. Hormonal regulation of physiological functions. The connection between the nervous and endocrine systems.
2. Functional classification of hormones. Synthesis, secretion, transport, and properties of hormones. The mechanisms of action of hormones on the cellular level.
3. Hypothalamo-hypophyseal system. Neurosecretory cells of the hypothalamus. Characteristics of hypothalamic releasing and inhibitory hormones. Hormones of the adenohypophysis: synthesis, secretion, and targets. Hormones of the neurohypophysis: synthesis, secretion, and their targets. Feedback regulation.
4. Hormones of the thyroid and parathyroid glands. Organification of iodine. Maintaining the concentrations of Ca^{2+} and phosphates in the blood.
5. Functions of the pancreas hormones. The regulation of glucose in the blood (pancreas, pituitary, and adrenal glands). Deficiency and excess of insulin. Diabetes types.
6. Functions of adrenal cortex hormones. Synthesis, regulation of secretion, and targets of corticosteroids.
7. Sympathoadrenal system. Catecholamine hormones and neurotransmitters. Nervous regulation of adrenal chromaffin tissue. Functions of adrenal hormones: synthesis, regulation of secretion, and their targets.
8. Female and male sex hormones and their functions. Regulation of their synthesis. Pre- and postnatal influence of sex hormones on the body.
9. Menstrual ovarian cycle, its neuroendocrine regulation. Endocrine regulation of fertilization, pregnancy, childbirth, and lactation.
10. Reproductive and hormonal functions of the male. Spermatogenesis. The male sexual act. Role of testosterone, mechanism of its action.