

**THEMATIC PLAN OF SEMINARS IN THE DISCIPLINE "NORMAL
PHYSIOLOGY – PHYSIOLOGY OF THE MAXILLOFACIAL REGION"
FOR STUDENTS OF THE EDUCATIONAL PROGRAM SPECIALIST IN
THE SPECIALTY 31.05.03,
FOR THE 2023-2024 ACADEMIC YEAR**

№	Thematic blocks	Hours (academic)
1	<p>Physiology of excitable tissues (part 1)¹ Excitable tissues. General and specific properties of excitable tissues. Stimuli and their classification. Concept of threshold of irritation. Threshold as a measure of excitability. Biological membranes, their structure and functions. Types of transport of substances through the membrane. Ion channels, their classification. Resting membrane potential. Modern ideas about its origin. Action potential and its phases. Conditions for occurrence of action potential. Modern ideas about mechanism of its generation. Excitability. Changes of excitability during excitation, phases of excitability. Ratio of between phases of action potential and phases of excitability changes during single excitation cycle. Electrical phenomena in oral cavity. Electro-chemical potentials (ECP), a potentiometric method for their registration²</p>	3
2	<p>Physiology of excitable tissues (part 2)¹ Laws of irritation of excitable tissues. "All-or-none" law, its relative nature. Law of force. Law of "force-duration". Concept of rheobase, useful time and chronaxia. Chronaxia as a measure of excitability. Law of gradient (rate of increase in the strength of stimulus in time). Phenomenon of accommodation in excitable tissues. Critical slope as a measure of accommodation. Electrodiagnostics in dentistry. Electroodontodiagnosics. Physiology of nerves and nerve fibers. Types of nerve fibers. Mechanism of excitation conduction along myelinated and unmyelinated nerve fibers. Laws of conduction excitation along nerve fibers and whole nerves. Lability and parabiosis of nerve fibers. Usage of phenomena of parabiosis in dental practice for drug-induced local anesthesia²</p>	3
3	<p>Physiology of synapses and muscle contraction¹ Synapse, classification of synapses. Electrical synapses: structure and properties. Chemical synapses, structure. Mechanism of signal transmission in chemical excitatory synapses. Characteristic of the exciting postsynaptic potential. Physiological properties of chemical synapses. Myoneural synapse, its features. The concept of the potential of the end plate, its role in generating an action potential on the muscle membrane. Structural and functional organization of muscles. Physical and physiological properties of skeletal muscles. The submicroscopic structure of the myofibril. The concept of</p>	3

	<p>sarcomere. Contractile and regulatory proteins. Mechanism of muscle contraction. The role of calcium in the coupling of Electromechanical processes. Single muscle contraction of its phase. Summation of abbreviations, tetanus. Modes of muscle contractions. The features of muscles of the maxillofacial region²</p>	
4	<p>Physiology of central nervous system. Physiology of autonomic nervous system (conditioned reflexes)¹ Functional organization of the central nervous system. Neuron as a structural and functional unit of the central nervous system, structure, properties. Classification of neurons. The concept of reflex. Classification of reflexes. Reflex arc as a morphological substrate of the reflex. Reverse afferentation, its role. Receptive field of the reflex, time of the reflex. Nerve center. Anatomical and physiological concept of the nerve center. Properties of nerve centers. Concept of inhibition in the central nervous system, its role in the coordination of reflex ac-tivity. Classification of central inhibition. Inhibitory synapses, features of signal transmission in the inhibitory chemical synapse, the concept of IPSP. Primary inhibition: pre- and postsynaptic, mechanisms of formation, mediators and receptors to them. Secondary inhibition (pessimal inhibition by Vvedensky and inhibition following excitation – induction). Principles underlying the coordination activities of the central nervous system²</p>	3
5	<p>Physiology of central nervous system. Physiology of autonomic nervous system (autonomic nervous system)¹ Autonomic nervous system, its structure and functions. Differences in the organization of the autonomic and somatic nervous systems. Sympathetic division of autonomous nervous system, its structural and functional features (centers, characteristics of fibers and ganglia, mediators, receptors to them, objects of innervation and influence on them). Parasympathetic division of autonomous nervous system, its structural and functional features (centers, characteristics of fibers and ganglia, mediators, receptors to them, objects of innervation and influence on them). Metasympathetic division of autonomic nervous system, its structural and functional features, its role in regulating the activity of internal organs. Types of visceral reflexes: viscerovisceral, viscerosomatic, somatovisceral and viscerosensory²</p>	3
6	<p>Physiology of endocrine system¹ Concept of endocrine system. Representation of main components of endocrine system (true endocrine glands, mixed secretions, diffuse endocrine system, cells of non-endocrine organs that have endocrine function). Hormones, their role and functions. Classification of hormones. Properties and features of the action of hormones. Pathways and mechanisms of action of hormones on target cells (membrane and intracellular). Hypothalamic-pituitary system and its functions. Pituitary gland and its hormones their role. Role of endocrine glands in development and formation of the maxillofacial region²</p>	3

7	<p>Higher nervous activity¹ Unconditional and conditional reflexes, their comparative characteristics. Conditioned reflexes: types, methods and rules for developing conditioned reflexes in animals and humans. Inhibition of conditioned reflexes: types and their characteristics. I. P. Pavlov's concept about the types of HNA. Role of heredity and environment in the formation of the type of HNA. First and second signaling systems in humans, their role. Structure and functional significance of individual regions of the cerebral cortex. Sleep: types of sleep, sleeping patterns, understanding the mechanisms of sleep. Emotions: functions, types, theories, mechanisms of emotions²</p>	3
8	<p>Physiology of sensory systems (general questions, visual analyzer, gustatory, olfactory and pain analyzers)¹ I. P. Pavlov's teaching about analyzers (sensory systems). General principles of analyzers structure. Main functions of the analyzers: detection, signal discrimination, signal conversion, encoding and conducting information, detection and identification of images. Sensory receptors: classification, properties, mechanism of receptor excitation, receptor and generator potentials. Visual analyzer: receptor, conductor, cortical departments. Optical system of the eye. Concept of refraction. Accommodative system of the eye. Accommodation and its mechanisms. Retina of the eye, its structure. Photoreceptors, mechanism of sensory transformation in the visual system. Taste analyzer: receptor, conduction, cortical parts. Signal conversion and transmission mechanisms. Olfactory analyzer: receptor, conductor, cortical. Signal conversion and transmission mechanisms. Pain analyzer: receptor, conductor, cortical. Signal conversion and transmission mechanisms. Types of pain. Theories of pain. Conductors and central mechanisms of dental pain. Antinociceptive system: nervous and humoral mechanisms. Physiological basis and methods of anesthesia²</p>	3
9	<p>Metabolism and energy¹ Methods of direct and indirect (complete and incomplete gas analysis) calorimetry. Concept of caloric value, respiratory coefficient and caloric equivalent of oxygen utilization, their values for different types of oxidized nutrients. Specific dynamic action of nutrients. Basal metabolism, conditions determining basal metabolism, factors affecting its value. General metabolism, working increase. Value of general metabolism for different types of labor. Principles of food ration preparation. Role of proteins, fats, and carbohydrates in nutrition, and daily need for nutrients. Importance of water, minerals and vitamins in nutrition. Thermoregulatory system: thermoreceptors, their classification; concept of isothermal conditions; mechanisms of heat production and heat loss²</p>	3

10	<p>Physiology of the digestive system (digestion in the oral cavity)¹ The essence of the digestive process. A functional system that maintains a constant level of nutrients in the blood. Methods of studying the functions of the digestive glands. The essence of the chronic research method created by I.P. Pavlov, its advantages. The role of the oral cavity in the digestive process. Composition and properties of saliva. Schemes of the reflex arc of the unconditional salivation reflex. Adaptive nature of salivation to various food and rejected substances²</p>	3
11	<p>Physiology of the digestive system (digestion in the stomach and intestines)¹ General characteristics of the digestive processes in the stomach. Composition and properties of gastric juice. Regulation of gastric secretion: a) the first phase is complex reflex; b) the second phase is gastric (neurohumoral); the main foods that excite gastric secretion; c) the third phase is intestinal. Composition and properties of pancreatic juice. Regulation of pancreatic secretion: a) complex reflex phase; b) humoral phase. The role of bile in digestion. The composition and properties of bile. Regulation of bile formation. The main food products that enhance bile formation. The mechanism of bile secretion, its reflex and humoral regulation. Intestinal juice, its composition and properties. Types of contractions of the musculature of the gastrointestinal tract, their characteristics. Regulation of the motor function of the gastrointestinal tract. Absorption of basic nutrients, the mechanism of absorption, its regulation. Center of nutrition. Modern ideas about the mechanisms of hunger, thirst, and satiety²</p>	3
12	<p>Physiology of respiration¹ Principles of the organization of the functional respiratory system. Breathing, its main stages. The mechanism of external respiration. Biomechanics of inhalation and exhalation. Pressure in the pleural cavity and its origin and role in the mechanism of external respiration. Changes in pressure in the pleural cavity in different phases of the respiratory cycle. The liquid and its components. Methods of their determination. Residual volume. Minute volume of breathing. "Dead space" and effective pulmonary ventilation. Why rare and deep breathing is more effective. Composition of atmospheric and exhaled air. The concept of partial pressure of gases. Gas exchange in the lungs. The partial pressure of gases (O₂ and CO₂) in the alveolar air and the voltage of gases in the blood. the value of carbonic anhydrase. The main regularities of the transition of gases through the membrane. Exchange of gases between blood and tissues. The voltage of O₂ and CO₂ in the blood, tissue fluid and cells. Transport of gases by blood: a) transport of O₂ by blood; the dissociation curve of oxyhemoglobin, its characteristics; oxygen capacity of blood; b) transport of carbon dioxide by blood; the relationship of transport of O₂ and CO₂.</p>	3

	<p>Innervation of the respiratory muscles.</p> <p>The respiratory center. Modern concepts of structure and localization. Automatism of the respiratory center of the medulla oblongata. The dependence of the activity of the respiratory center on the gas composition of the blood. The role of chemoreceptors in the regulation of respiration. The role of mechanoreceptors in the regulation of respiration. The role of carbon dioxide in the regulation of respiration. The mechanism of the newborn's first breath. Conditioned reflex regulation of breathing.</p> <p>Protective respiratory reflexes.</p> <p>Features of breathing in various conditions: a) respiration during muscular work; b) respiration at low atmospheric pressure (altitude sickness); c) respiration at high atmospheric pressure (caisson disease); d) artificial respiration; e) periodic respiration²</p>	
13	<p>Blood physiology¹</p> <p>Blood functions. Blood composition. The amount of blood in the body, its relative constancy. Blood plasma, its quantity, composition. Electrolyte composition. Osmotic pressure. Osmotic resistance of erythrocytes.</p> <p>Regulation of constancy. Plasma proteins, quantity, their physiological role. Oncotic pressure, its role.</p> <p>Erythrocyte sedimentation rate (ESR). Mechanism, clinical significance, indicators. Blood pH. Blood buffer systems. Regulation of blood pH constancy. Formed elements of blood.1 Erythrocytes, structure and functions. Normal content in the circulating blood. Hemolysis of erythrocytes, its types, causes. Erythropoiesis, its regulation. Hemoglobin, physiological value, quantity, types and compounds. Color indicator, clinical value, value. Leukocytes, their characteristics.</p> <p>Specific and non-specific immunity.</p> <p>Its mechanisms. Leukopoiesis, its regulation. Leukocyte formula, clinical significance. Platelets. Structure, quantity and functions²</p>	3
14	<p>The system of regulation of the aggregate state of blood (RASB), its main elements¹</p> <p>The concept of hemostasis, the process of blood clotting, its types, phases. Vascular-platelet hemostasis. Coagulation hemostasis. External and internal pathways of coagulation. Blood anticoagulation system. Physiological anticoagulants. Their role in maintaining the liquid state of the blood. Fibrinolysis, its phases.</p> <p>Blood types. The ABO system. Rh factor, its significance for medical practice. The concept of Rhesus conflict. Physiological and clinical foundations of blood transfusion. Blood-substituting solutions²</p>	3
15	<p>Physiology of the cardiovascular system¹</p> <p>The activity of the heart. Properties of the heart muscle. Anatomical and histological features of the structure of the heart. The main physiological properties of the heart.</p>	3

	<p>Automatism. Anatomical substrate and the nature of automatism, the action potential of the pacemaker cells. The leading role of the sinoatrial node. The gradient of automatism. Features of excitation in the heart muscle. Cardiomyocyte action potential, its phases and origin.</p> <p>Features of excitability of the heart muscle. The refractory period. Contractility. Coupling of the processes of excitation and contraction in the heart muscle, the role of extracellular calcium. Obeying the "All-or-none law". Conductivity, its features, the rate of excitation in various parts of the heart. The cardiac cycle, its phases. Blood pressure in the cavities of the heart in various phases of the cardiac cycle, the work of valves. Blood pressure in the cavities of the heart in various phases of the cardiac cycle, the work of valves. Extrasystole. Electrocardiography (ECG) as a method of registering heart biopotentials. Biophysical foundations of ECG. The main ECG leads. Normal human ECG, its genesis, clinical significance.</p> <p>The main indicators of heart activity: heart rate and strength, systolic and minute blood volume at rest and during exercise. Heart tones, apical push, their origin and characteristics.</p> <p>Intracardiac mechanisms of heart regulation: Intracardiac heterometric and homeometric mechanisms.</p> <p>Intercellular regulation. The law of "All or none", creative connections. The Frank-Starling Law. Intracardiac nervous regulation. The concept of peripheral intracardiac reflexes.</p> <p>Cholinergic and adrenergic mechanisms.</p> <p>Extra-cardiac regulation. Innervation of the heart. The influence of sympathetic and parasympathetic nerves on the heart. Central reflexes. The most important reflexogenic zones, chemo- and baroreceptive mechanisms.</p> <p>Conjugate reflexes: Danini-Aschner, Goltz. Humoral regulation. The effect of hormones, electrolytes, and metabolites on the work of the heart. Interaction of nervous and humoral mechanisms²</p>	
16	<p>Basics of hemodynamics¹</p> <p>Morpho-functional classification of blood vessels. Volumetric blood flow rate. The factors it depends on. Linear velocity of blood flow. Velocity in arteries, capillaries, veins. The time of the complete blood circulation. The value of vascular elasticity for blood flow. Vascular resistance. Factors affecting its value. Total peripheral resistance.</p> <p>The concept of vascular tone, its types. Basal tone, its origin. Vascular innervation. Vasoconstrictive nerves. Neurogenic mechanisms of vasodilation. Vasomotor center, its structure and functions. Reflexogenic zones and depressive reflexes. Own and conjugate reflexes of the cardiovascular system. Humoral regulation of vascular tone.</p> <p>Regional blood flow. Mechanisms of regulation. Features of coronary, cerebral blood flow, blood circulation in the small circle²</p>	3
17	<p>Physiology of the excretory system¹</p>	3

	<p>Kidneys and their function. Features of blood supply to the nephron. The process of urination. Glomerular filtration. Tubular reabsorption. Tubular secretion. Osmotic dilution and concentration of urine. Homeostatic kidneys function. The role of the kidneys in osmoregulation and volumoregulation. The role of the kidneys in the regulation of the ionic composition of blood. The role of the kidneys in the regulation of acid-base state.</p> <p>Excretory function of the kidneys. Endocrine function of the kidneys. Metabolic function of the kidneys. Nervous regulation of kidneys activity. Diuresis. The composition of urine. Urination and micturition²</p>	
TOTAL		51

¹ - subject

² - essential content

Considered at the meeting of the department of normal physiology "25" 05 2023,
protocol № 9a

Head of the Department



S.V. Клаучек