

**DEPARTMENT OF PHYSIOLOGY**  
**SYNOPSIS FOR THE FINAL EXAM IN PHYSIOLOGY FOR STUDENTS IN DENTAL**  
**MEDICINE**  
**ACADEMIC YEAR 2019/2020**

1. Control of the human body functions: homeostasis. Cell membrane: main characteristics.
2. Transport across the cell membrane. Passive and active transport. Exocytosis and endocytosis.
3. Intercellular communication: membrane and cellular receptors. G-proteins. Secondary messengers. Protein kinases.
4. Excitable tissues. Rest membrane potential and action potential: mechanisms of generation.
5. Propagation of action potentials along the nerve fibers. Refractory periods.
6. Synaptic transmission. Postsynaptic membrane receptors.
7. Neurotransmitters. Low molecular neurotransmitters and neuropeptides.
8. Skeletal muscle. Mechanism of muscle contraction. Excitation-contraction coupling.
9. Smooth muscle: morphological and functional characteristics. Mechanism of smooth muscle contraction.
10. Blood: functions and properties. Blood plasma. Red blood cells (erythrocytes). Blood types.
11. White blood cells (leukocytes). Functions of the different types of leukocytes.
12. Platelets (thrombocytes). Hemostasis: phases. Fibrinolytic system.
13. Immunity. Innate and acquired immunity.
14. Functional morphology of the cardiac muscle. Action potentials. Excitation-contraction coupling: role of  $Ca^{2+}$ . Electrocardiography.
15. Cardiac cycle. Stroke volume and cardiac output. Heart sounds.
16. Regulation of cardiac function. Intracardial regulation: preload and afterload. Extracardial regulation: neural and humoral one.
17. Circulation: general overview. Principles of hemodynamics. Arterial pressure. Factors, which determine arterial pressure.
18. Regulation of circulation: medullary and supramedullary cardiovascular centers. Short-term and long-term regulation.
19. Microcirculation and circulation in special regions: pulmonal, cerebral, myocardial and splanchnic one. Typical characteristics of the circulation in the facial region and in the oral cavity.
20. Respiration. Structure and function of the respiratory system. Function of the airways. Control of bronchial tone.
21. Pulmonary ventilation. Mechanisms of inspiration and expiration. Pulmonary volumes and capacities.
22. Gas exchange in the body. Composition of the inspired, alveolar and expired air. Gas diffusion through the respiratory membrane.
23. Exchange and transport of oxygen. Oxyhemoglobin dissociation curve. Exchange and transport of carbon dioxide.
24. Regulation of respiration.
25. Structure and functions of the digestive system. Regulation of the gastrointestinal functions: neural and humoral control.
26. Chewing (mastication) and swallowing. Cycles, periods and phases. Control of chewing and swallowing.
27. Motor activity of the stomach, small intestine and colon. Regulation. Vomiting. Defecation.
28. Production, composition and functions of saliva. Control of salivary secretion.
29. Gastric and pancreatic juice: volume, composition and regulation of the secretion.
30. Bile and intestinal secretion: volume, composition and regulation of the secretion.
31. Digestion and absorption of carbohydrates, lipids and proteins in the gastrointestinal tract. Regulation of intestinal absorption.
32. Liver functions.
33. Carbohydrate metabolism. Control of blood glucose level.

34. Protein metabolism. Lipid metabolism. Regulations.
35. Energy metabolism. Basal metabolism and energy output in different physiological conditions. Nutrition and energy balance.
36. Vitamins. Minerals.
37. Body temperature. Mechanisms of thermoregulation. Fever.
38. Kidney: functional morphology. Glomerular filtration. Tubular transport.
39. Concentration and dilution of urine. Volume and composition of urine. Regulation of renal functions.
40. Volume and composition of body fluids. Water and electrolyte balance in the body. Regulation of fluid-electrolyte homeostasis.
41. Acid-base balance in the body.
42. Physiology of the skin.
43. Hormones: classification and mechanism of action. General principles of regulation of hormonal secretion.
44. Hypothalamo-hypophyseal system. Neurosecretion. Neurohypophyseal and adenohypophyseal hormones.
45. Control of calcium-phosphate balance. Calcium-phosphate balance in the teeth: typical characteristics.
46. Thyroid hormones: mechanism of action, physiological effects and control of their secretion.
47. Endocrine pancreas. Pancreatic hormones: physiological effects and control of their secretion.
48. Adrenal glands. Cortical and medullary hormones. Sympatho-adrenal system. Stress reactions.
49. Male reproductive function. Control of spermatogenesis and hormonal secretion.
50. Female reproductive function. Menstrual cycle. Control of hormonal secretion.
51. General overview of the nervous system functions. Types of neurons. Amplitude and frequency encoding of information. Axonal transport. Glia.
52. Reflex activity of the nervous system. Neural networks. Inhibition in the central nervous system.
53. Sensory systems – general overview. Receptors and receptor potentials. Receptive fields. Cortical representation of sensory systems.
54. Somatosensory system. Receptors, afferent pathways and central processing of information.
55. Pain. Primary and secondary pain. Visceral pain. Tooth pain. Antinociceptive system.
56. Somatic sensations in the facial region and oral cavity.
57. Auditory system. Structure and function of the ear.
58. Visual system. Structure and function of the eye.
59. Vestibular system. Functions of utricle, saccule and semicircular canals.
60. Olfactory and gustatory sensory systems.
61. Control of movement: general overview. Spinal control of movement. Myotatic (stretch) reflexes.
62. Brainstem and cortical control of movement. Cerebellum and basal ganglia participation in the motor control.
63. Sleep and wakefulness. Electroencephalogram. Biological rhythms.
64. Autonomic nervous system. Effects of the autonomic nervous system on the activity of different organs.
65. Hypothalamus and limbic system. Physiological basis of emotions and motivations.
66. Higher functions of the nervous system. Neurophysiological basis of learning, memory and speech.
67. Physiology of exercise. Changes in the body functions during exercise and in hypo- and hyperbaric conditions, acceleration and weightlessness.

Signed by the Head of the Department of Physiology,  
Prof. R. Girchev, MD, PhD, DSc