

Medical Physiology final exam questions

- 1 Membrane transport mechanisms. Active and passive transport.
- 2 Transport function across epithelia (absorption and secretion).
- 3 General principles of the regulation of cellular function: receptors, signal transduction, second messengers.
- 4 Significance of the intracellular Ca^{2+} in signal transduction.
- 5 Origin of the resting membrane potential. Characterisation of the ionic channels.
- 6 Local changes of the membrane potential.
- 7 Action potential and its propagation. The strength-duration curve.
- 8 Genesis and conduction of the action potentials in the heart.
- 9 Electric properties of the ventricular cardiomyocytes. Refractive periods of the ventricular cells, and their significance.
- 10 Foundations of electrocardiography, possible recording techniques and interpretation of the ECG curves.
- 11 Contractile properties of the myocardium.
The excitation-contraction coupling in the heart.
- 12 The sarcomere length-tension diagram and its significance in cardiac and in skeletal muscle.
- 13 The ventricle as a pump. Pressure and flow work of the heart.
- 14 Heterometric regulation of cardiac output
- 15 Homometric regulation of cardiac output
- 16 The Frank-Starling mechanism.
- 17 Regulation of cardiac function: effect of the autonomic nervous system.
The effect of extracellular ions on the cardiac activity.
- 18 Regulation of cardiac function: significance of the alteration of the pre- and afterload.
- 19 The cardiac cycle. The effect of heart rate on the duration of systole and diastole.
- 20 Fluid compartments of the human body. Electrolyte and non-electrolyte content of the various compartments. The homeostasis.
- 21 Functional properties and significance of the red blood cells.
- 22 Possible reasons of jaundice. Classification of jaundice.
Characterisation of the various types of jaundice.
- 23 Composition of the blood plasma. Functions of the plasma proteins.

- 24 The human blood types.
- 25 The haemostasis.
- 26 General properties of the systemic and pulmonary circulations. Definition and determination of the mean arterial pressure. Factors influencing the mean arterial pressure.
- 27 The Hagen-Poiseuille law. The Reynolds number. Pressure-flow correlations in rigid tubes and in the vascular system.
- 28 Properties and significance of the arterial circulation. Central and peripheral pulse waves.
- 29 Properties of capillary circulation. Possible reasons of oedema formation.
- 30 Properties of venous circulation. Factors influencing the venous circulation.
- 31 Basal tone of the vascular smooth muscle cells, and its significance.
Factors influencing the basal tone.
- 32 Resting vasoconstrictor tone of the vascular smooth muscle cells, and its significance.
Factors influencing the resting vasoconstrictor tone.
- 33 Humoral vasoconstrictor and vasodilator mechanisms.
- 34 Neural vasoconstrictor and vasodilator mechanisms.
- 35 Catecholamine-induced cardiovascular reactions.
- 36 Reflex control of the cardiovascular system.
- 37 Regulation of mean arterial pressure
- 38 Cardiovascular reflexes, which increase the mean arterial pressure.
- 39 Cardiovascular reflexes, which decrease the mean arterial pressure.
- 40 The significance of the endothelium in the control of vascular tone.
- 41 Characterisation of the pulmonary circulation.
- 42 Characterisation of the coronary circulation.
- 43 Characterisation of the cerebral circulation.
- 44 Specific features of the gastrointestinal and renal circulations.
- 45 Specific features of the circulation of the skeletal muscle and skin.
- 46 Mechanics of respiration, pressure changes accompanying the breathing.
- 47 The significance of surfactant. Lung volumes.

- 48 Pulmonary compliance and respiratory work.
- 49 Bronchoconstriction and bronchodilation; factors evoking them.
- 50 Transport of O₂ in the blood.
- 51 Transport of CO₂ in the blood.
- 52 Chemical control of breathing.
- 53 Neuronal control of breathing. Function of the respiratory centres. The Hering-Breuer reflex.
- 54 Gas exchange accompanying respiration. Types and possible treatment of hypoxia.
- 55 General characterisation of the function of the gastrointestinal tract.
Parts and characterisation of the enteric nervous system.
- 56 Organisation of the gastrointestinal reflexes. Neurotransmitters participating in the gastrointestinal reflexes.
- 57 Effect of the autonomic nervous system on the function and reflex mechanisms of the gastrointestinal tract.
- 58 Endocrine and paracrine regulation of the gastrointestinal system.
Characterisation of the most significant enterohormones.
- 59 Motoric function of the gastrointestinal tract: swallowing, vomiting and the motoric activity of the stomach.
- 60 Motoric function of the gastrointestinal tract: motoric activities of the small and large intestines.
- 61 The defecation reflex.
- 62 Characteristics of the secretion of saliva.
- 63 Characteristics of the secretion of gastric juice. Composition, mechanisms of secretion regulation.
- 64 Exocrine function of the pancreas.
- 65 Exocrine functions of the liver and intestines.
- 66 Degradation, digestion and absorption of the foodstuffs.
- 67 Definition and characterisation of the nutrients. Fat soluble vitamins.
- 68 Water soluble vitamins.
- 69 Energy balance of the human body. Characterisation of the most important sources of energy.
- 70 Basic metabolic rate, calorimetry, RQ, specific dynamic action, BMI.
- 71 Thermoregulation and fever.

- 72 Characterisation of the synaptic transmission.
- 73 Function of the neuromuscular junction.
- 74 Characterisation of the function of the receptor cells. Definition of the adequate stimulus.
- 75 Characterisation of the function of the skeletal muscle. Definition of the motor unit.
The electromyogram.
- 76 Excitation-contraction coupling in the skeletal muscle.
- 77 Physiology of the smooth muscle function. Types and characteristics of the smooth muscle.
- 78 Electromechanical and pharmacomechanical coupling of the smooth muscle cells.
Characteristics of the mechanical response. Plasticity.
- 79 Physiological changes during exercise.
- 80 Energy background of the muscle function. The metabolic aspects of the exercise.
- 81 General characterisation of the function of the nephrons.
- 82 Quantitative description of the renal function: definition, calculation and significance of the extraction coefficient and clearance.
- 83 Correlation between the extraction coefficient and clearance. Definition, calculation and significance of RPF, RBF, GFR and FF.
- 84 Mechanisms of excretion of inulin, glucose and PAH.
- 85 Mechanisms of the glomerular filtration.
- 86 Factors influencing GFR. Components of the effective filtration pressure of the glomerulus.
- 87 Regulation of glomerular filtration.
- 88 Transport mechanisms of the proximal tubule. The glomerulo-tubular balance.
- 89 Characteristics and transport mechanisms of the loop of Henle and the distal nephron.
- 90 Transport mechanisms of the collecting duct.
- 91 Diluting and concentrating functions of the kidney.
- 92 Mechanisms of osmoregulation.
- 93 Na⁺ homeostasis and volume regulation.
- 94 Mechanisms of pH regulation. Buffer systems of the blood. Significance of the respiration and renal functions in maintaining the constant pH of the blood.
- 95 Acid-base disturbances.

- 96 K⁺ balance.
- 97 Micturition.
- 98 Definition of diuretics. Mechanisms of their action. Classification of the diuretics.
- 99 Ca²⁺ homeostasis and physiology of the bone.
- 100 Hormones regulating the Ca²⁺ concentration of the plasma.
- 101 General characterisation of the neuroendocrine regulation. Comparison of the humoral and neural regulation. Interactions of the humoral and neural regulatory mechanisms.
- 102 Structure, biosynthesis and storage of hormones.
- 103 Secretion and mechanism of action of the hormones.
- 104 Function of the hypothalamo-hypophyseal system. Connections between the hypothalamus and adenohipophysis.
- 105 Hormones of the neurohypophysis and their significance.
- 106 Physiology of the growth hormone. Consequences of over- and underproduction of the growth hormone.
- 107 Sexual differentiation. Physiology of the testicular functions and androgens.
- 108 Female sexual hormones.
- 109 Regulation of the female sexual cycle.
- 110 Endocrine changes accompanying pregnancy and parturition.
- 111 Endocrine changes accompanying lactation.
- 112 Hormones of the adrenal medulla.
- 113 Hormones of the adrenal cortex.
- 114 Physiological effects of the glucocorticoids.
- 115 Pharmacological effects of the glucocorticoids.
- 116 Biosynthesis, transport and mechanism of action of the thyroid hormones.
- 117 Physiological effects of the thyroid hormones. Regulation of the secretion of the thyroid hormones.
- 118 Consequences of the over- and underproduction of the thyroid hormones.
- 119 Biosynthesis, molecular structure, transport and physiological effects of insulin.

- 120 Regulation of insulin secretion.
- 121 Consequences of over- and underproduction of insulin. Glucose-tolerance tests.
- 122 Glucagon, somatostatin and pancreatic polypeptide. Regulation of glucagon secretion.
- 123 Overview of the hormones regulating the blood glucose level. Complex regulation of the blood glucose level.