Medical Physiology final exam questions

1. Membrane transport mechanisms. Active and passive transport.
2. Transport function across epithelia (absorption and secretion).
4. Significance of the intracellular Ca2+ in signal transduction.
6. Local changes of the membrane potential.
8. Genesis and conduction of the action potentials in the heart.
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.
23. Composition of the blood plasma. Functions of the plasma proteins.
The human blood types.

The haemostasis.

General properties of the systemic and pulmonary circulations. Definition and determination of the mean arterial pressure. Factors influencing the mean arterial pressure.

The Hagen-Poiseuille law. The Reynolds number. Pressure-flow correlations in rigid tubes and in the vascular system.

Properties and significance of the arterial circulation. Central and peripheral pulse waves.

Properties of capillary circulation. Possible reasons of oedema formation.

Properties of venous circulation. Factors influencing the venous circulation.

Basal tone of the vascular smooth muscle cells, and its significance.

Factors influencing the basal tone.

Resting vasoconstrictor tone of the vascular smooth muscle cells, and its significance.

Factors influencing the resting vasoconstrictor tone.

Humoral vasoconstrictor and vasodilator mechanisms.

Neural vasoconstrictor and vasodilator mechanisms.

Catecholamine-induced cardiovascular reactions.

Reflex control of the cardiovascular system.

Regulation of mean arterial pressure

Cardiovascular reflexes, which increase the mean arterial pressure.

Cardiovascular reflexes, which decrease the mean arterial pressure.

The significance of the endothelium in the control of vascular tone.

Characterisation of the pulmonary circulation.

Characterisation of the coronary circulation.

Characterisation of the cerebral circulation.

Specific features of the gastrointestinal and renal circulations.

Specific features of the circulation of the skeletal muscle and skin.

Mechanics of respiration, pressure changes accompanying the breathing.

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.
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.
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.
Characterisation of the synaptic transmission.

Function of the neuromuscular junction.

Characterisation of the function of the receptor cells. Definition of the adequate stimulus.

Characterisation of the function of the skeletal muscle. Definition of the motor unit. The electromyogram.

Excitation-contraction coupling in the skeletal muscle.

Physiology of the smooth muscle function. Types and characteristics of the smooth muscle.


Physiological changes during exercise.

Energy background of the muscle function. The metabolic aspects of the exercise.

General characterisation of the function of the nephrons.

Quantitative description of the renal function: definition, calculation and significance of the extraction coefficient and clearance.

Correlation between the extraction coefficient and clearance. Definition, calculation and significance of RPF, RBF, GFR and FF.

Mechanisms of excretion of inulin, glucose and PAH.

Mechanisms of the glomerular filtration.

Factors influencing GFR. Components of the effective filtration pressure of the glomerulus.

Regulation of glomerular filtration.

Transport mechanisms of the proximal tubule. The glomerulo-tubular balance.

Characteristics and transport mechanisms of the loop of Henle and the distal nephron.

Transport mechanisms of the collecting duct.

Diluting and concentrating functions of the kidney.

Mechanisms of osmoregulation.

Na+ homeostasis and volume regulation.

Mechanisms of pH regulation. Buffer systems of the blood. Significance of the respiration and renal functions in maintaining the constant pH of the blood.

Acid-base disturbances.
K+ balance.

Micturition.

Definition of diuretics. Mechanisms of their action. Classification of the diuretics.

Ca2+ homeostasis and physiology of the bone.

Hormones regulating the Ca2+ concentration of the plasma.

General characterisation of the neuroendocrine regulation. Comparison of the humoral and neural regulation. Interactions of the humoral and neural regulatory mechanisms.

Structure, biosynthesis and storage of hormones.

Secretion and mechanism of action of the hormones.

Function of the hypothalamo-hypophyseal system. Connections between the hypothalamus and adenohypophysis.

Hormones of the neurohypophysis and their significance.

Physiology of the growth hormone. Consequences of over- and underproduction of the growth hormone.

Sexual differentiation. Physiology of the testicular functions and androgens.

Female sexual hormones.

Regulation of the female sexual cycle.

Endocrine changes accompanying pregnancy and parturition.

Endocrine changes accompanying lactation.

Hormones of the adrenal medulla.

Hormones of the adrenal cortex.

Physiological effects of the glucocorticoids.

Pharmacological effects of the glucocorticoids.

Biosynthesis, transport and mechanism of action of the thyroid hormones.

Physiological effects of the thyroid hormones. Regulation of the secretion of the thyroid hormones.

Consequences of the over- and underproduction of the thyroid hormones.

Biosynthesis, molecular structure, transport and physiological effects of insulin.
Regulation of insulin secretion.

Consequences of over- and underproduction of insulin. Glucose-tolerance tests.

Glucagon, somatostatin and pancreatic polypeptide. Regulation of glucagon secretion.

Overview of the hormones regulating the blood glucose level. Complex regulation of the blood glucose level.