

Comprehensive exam topics in Medical Physiology 2023/2024

1. (1) Principles of control theory.
2. (2) Passive transport mechanisms of the cell membrane.
3. (3) Active transport mechanisms of the cell membrane.
4. (7) Receptors, signal transduction mechanisms.
5. (8) Fluid compartments of the body. The blood plasma.
6. (9) The general features of red blood cells.
7. (10) Erythropoiesis.
8. (11) Hemoglobin degradation, bilirubin metabolism.
9. (12) The physiology of white blood cells.
10. (13) The ABO and Rh blood groups.
11. (14) Primary hemostasis.
12. (15) Secondary hemostasis: blood clotting (coagulation).
13. (16) Fibrinolysis. Inhibition of clotting in vitro and in vivo.
14. (25) Respiratory mechanics 1: Static mechanics of the lung and the chest.
15. (26) Respiratory mechanics 2: Ventilation.
16. (27) Pulmonary gas exchange.
17. (28) Oxygen transport in blood.
18. (29) Carbon-dioxide transport in blood.
19. (31) The chemical control of ventilation.
20. (32) Biology of the airways. Metabolic and endocrine functions of the lung.
21. (59) Principles of the regulation of the gastrointestinal tract.
22. (62) Functions of the upper GI tract: chewing, salivation, swallowing.
23. (63) Motor functions of the stomach. Vomiting (emesis).
24. (64) The mechanism and regulation of gastric juice secretion.
25. (65) The exocrine pancreas: secretion and regulation.
26. (66) The bile: secretion, storage, mobilization, regulation.
27. (67) The small intestine: digestion and absorption.
28. (68) The functions of the colon. Defecation.
29. (69) Nutrition: energy metabolism, the role of macronutrients in energy intake.
30. (70) Nutrition: water, minerals, vitamins, dietary fibers.
31. (71) Principles of endocrine control systems.
32. (72) Characterization of the hypothalamo-hypophyseal (neuroendocrine) system.
33. (73) Thyroid hormones: biosynthesis, regulation, effects.
34. (74) Hormone synthesis in the adrenal cortex. The glucocorticoids: biosynthesis, regulation, effects.
35. (75) The endocrine pancreas.
36. (76) The integrated endocrine control of metabolism. Stress and general adaptation syndrome.
37. (85) The development and physiology of the male reproductive system
38. (86) The physiology of the female reproductive system, the menstrual cycle.
39. (87) The physiology of the sexual act, fertilization, and implantation
40. (88) The neuroendocrine control of pregnancy, parturition and lactation.
41. (90) Physiology of growth and puberty.
42. (22) Skeletal muscle: structure, electromechanical coupling, the biochemistry of contraction.
43. (23) Skeletal muscle: the mechanics and energetics of muscle contraction.
44. (24) Smooth muscle physiology.
45. (33) Hemodynamics: basic biophysical principles.
46. (34) Hemorheology.
47. (35) Cardiac muscle: structural and functional characterization, regulation of contractile force.
48. (36) Cardiac cycle. The jugular pulse.

49. (37) Preload and afterload, the Frank-Starling law of the heart.
50. (38) Cardiac muscle: cellular electrophysiology.
51. (39) Electrocardiography, other methods for the assessment of cardiac function.
52. (40) Cardiac work and metabolism. The coronary circulation.
53. (41) Hemodynamics: The functional categorization of blood vessels.
54. (42) The function of the aorta and the arteries.
55. (43) The microcirculation: capillary solute exchange and fluid dynamics.
56. (44) The microcirculation: lymphatic circulation and edema formation.
57. (45) The characteristics of the venous circulation.
58. (46) The regulation of local blood flow.
59. (47) Factors determining cardiac output, the Guyton diagram.
60. (48) Short-term control mechanisms of arterial blood pressure.
61. (49) Long-term control of arterial blood pressure.
62. (50) Pulmonary circulation.
63. (51) Skeletal muscle blood flow, the cardiovascular adaptation to work and exercise.
64. (52) Glomerular filtration: the factors determining the volume and composition of filtrate
65. (53) Renal blood flow. The regulation of GFR and RBF.
66. (54) The general features of epithelial transport mechanisms in the renal tubuli.
67. (55). Tubular reabsorption and secretion. Renal clearance.
68. (56) Renal tubular transport of organic solutes: glucose, amino acids, ketone bodies, proteins, uric acid, urea, UBG.
69. (57). Renal tubular transport of NaCl and water, production of the medullary osmotic gradient.
- 70 (58) The physiology of the urinary tract. Micturition.
71. (60). Special functional features of the gastrointestinal smooth muscle.
72. (61) The splanchnic circulation.
73. (78) The concentration and dilution of urine. Osmoregulation.
74. (79) Volume regulation (the regulation of Na⁺ metabolism and extracellular fluid volume).
75. (80) The regulation of K⁺ metabolism.
76. (81) The regulation of Ca²⁺ and phosphate metabolism.
77. (82) Acid-base balance.
78. (83) Thermoregulation, cutaneous blood flow.
79. (84) Sports physiology.
80. (89) The fetal circulation, the cardiorespiratory adaptation of the neonate.
81. (91) The control of cerebral blood flow, the cerebrospinal fluid, barrier systems of the brain.
82. (4) The resting membrane potential.
83. (5) The electric properties of neuronal membranes.
84. (6) The axonal propagation of the action potential. Axon classification.
85. (17) Neurotransmission.
86. (18) The peripheral nervous system: primary sensory neurons.
87. (19) The parasympathetic division of the autonomic nervous system.
88. (20) The sympathetic division of the autonomic nervous system. The adrenal medulla.
89. (21). The peripheral nervous system: motor neurons, neuromuscular junction.
90. (30) The rhythmogenesis of breathing, ventilatory reflexes elicited from the lung.
91. (77) Nutrition: The internal control of food intake.
92. (92) The somatosensory nervous system: receptors.
93. (93)The somatosensory nervous system: the dorsal column ascending pathways.
94. (94) The somatosensory nervous system: the anterolateral (spinothalamic) ascending pathways.
95. (95) The somatosensory nervous system: nociception and pain.
96. (96) The visual system: protection of the eye, image formation, refraction errors.
97. (97) The visual system: the function of the photoreceptors, retinal signal processing.
98. (98) The visual system: the visual field and the visual pathways.

99. (99) The visual system : the control of eye movements.
100. (100) The visual system : cerebrocortical mechanisms.
101. (101) The visual system : binocular vision, color vision.
102. (102) Hearing: the function of the outer and the middle ear. Hearing tests.
103. (103) Hearing: the function of the inner ear, auditory pathways.
104. (104) The physiology of olfaction.
105. (105) The physiology of taste sensation.
106. (106) The motor reflex. The structure and function of muscle proprioceptors.
107. (107) The myotatic and the inverse myotatic spinal reflex.
108. (108) The gamma fusimotor servomechanism (gamma-loop).
109. (109) Exteroceptive spinal reflexes.
110. (110) The spinal integration of rhythmic locomotive movements. The spinal interneurons.
111. (111) The consequences of spinal cord hemisection and transection.
112. (112) The control of muscle tone.
113. (113) The control of body posture. The vestibular system.
114. (114) The cerebrocortical control of movements.
115. (115) The cerebellum.
116. (116) The basal ganglia.
117. (117) The integration of autonomic functions in the CNS. Functions of the hypothalamus.
118. (118) The functions of the limbic system. Emotions.
119. (119) Electroencephalogram (EEG) and the physiology of sleep-wake cycles.
120. (120) The circadian rhythm and the pineal gland.
121. (121) Cognitive functions, language and speech.
122. (122) Neuronal plasticity, learning and memory.