

Physiology 2013

Part A

1. Structure and function of cell membranes
2. Structure and function of cell organelles
3. Passive transport across membranes. Co-transport
4. Compartmentalization of body fluids
5. Differences between intra- and extracellular fluids
6. Production and resorption of interstitial fluid (Starling forces)
7. Ion channels
8. Intercellular communication
9. Second messengers
10. Functions of the nerve cell
11. Functional morphology of synapses
12. Synthesis and break down of transmitters
13. Proteosynthesis
14. Generation of resting membrane potential
15. Local response of membrane potential
16. Action potential
17. Up- and down-regulation of receptors
18. Excitability and refractoriness
19. Excitation-contraction coupling
20. Molecular mechanism of muscle contraction
21. Electrical and mechanical behaviour of skeletal muscle
22. Electrical and mechanical behaviour of smooth muscle
23. Electrical and mechanical behaviour of cardiac muscle
24. Isometric and isotonic contraction. Length-tension relation.
25. Neuromuscular junction
26. Temporal and space summation (summation and recruitment) in skeletal muscle
27. Energy production and conservation
28. Caloric content of food. Direct calorimetry.
29. Energy balance. Indirect calorimetry.
30. Physiological role of calcium
31. Vitamins – overview
32. Hypovitaminoses and hypervitaminoses
33. Basal metabolism
34. Principles of balanced nutrition
35. Glycaemia
36. Acid-base balance
37. Hypoxia and ischemia
38. Heat production and heat loss
39. Hormone-receptor complex
40. Physiological applications of law of Laplace
41. Invasive assessment of blood pressure
42. Non-invasive assessment of blood pressure
43. Measurement of cardiac output
44. Measurement of blood flow
45. Phonocardiography
46. ECG leads
47. ECG record in different leads
48. Estimation of electric axis of the heart
49. Cardiac contractility, ejection fraction, heart failure
50. Cardiac catheterisation
51. Polygraphic methods
52. Electromyography
53. Registration of membrane potentials and currents
54. External signs of breathing
55. Lung ventilation, volumes, measurement
56. Dead space, measurement
57. Resistance of airways, measurement
58. Pneumography and pneumotachography
59. Maximal respiratory flow – volume curve (spirogram)
60. pH measurement (Astrup method)
61. Clearance
62. AV conduction - long QT syndrome, WPW syndrome
63. Examination of baroreflex sensitivity
64. Examination of heart rate and blood pressure variability
65. Special methods of ECG and blood pressure examination (vectocardiography, 24-hour-monitoring, His bundle electrogram)
66. Examination methods in endocrinology (RIA, enzyme-immuno-analysis)
67. Reaction of circulatory system on bleeding
68. Reflex reactions of circulatory system (diving reflex, Valsalva manouvre, Müller manouvre)
69. Respiratory quotient
70. Cardiopulmonary response to exercise
71. Autocrine, paracrine, endocrine regulation
72. Chemical characteristics of hormones
73. Sympathetic alpha- and beta-receptors
74. Sex differentiation
75. Oogenesis
76. Hormonal contraception
77. Spermatogenesis
78. Puberty and menopause
79. Physiological significance of positive and negative feed-back
80. Physiological regulations (overview)
81. Homeostasis
82. Regulation of constant pH
83. Kidney in regulation of homeostasis
84. Regulation of cardiac output
85. Regulation of blood circulation upon orthostasis
86. Regulation of ventilation
87. Regulation of gastric and pancreatic secretion
88. Co-ordination of GIT segments
89. Thermoregulation
90. Regulation of renal functions
91. General principles of endocrine regulation
92. Sympathetic nervous system (overview)
93. Parasympathetic nervous system (overview)
94. Adaptation to extreme environmental conditions
95. Adaptation to exercise
96. Integration of nervous and hormonal regulation
97. Regulation and adaptation

Part B

1. Blood composition – values
2. Red blood cell. Haemolysis.
3. Haemoglobin and its derivatives
4. Erythropoiesis
5. Suspension stability of RBC (sedimentation rate)
6. Cellular immunity
7. Humoural immunity
8. Histocompatibility (MHC)
9. Cellular interactions in immune response
10. Blood groups antigens (ABO group, Rh group)
11. Function of platelets
12. Hemostasis
13. Anticlotting mechanism
14. Conduction system of the heart
15. Cardiac automaticity
16. Spread and retreat of excitation wavefront
17. Electric vector of the heart. Vectocardiography.
18. Specific features of cardiac metabolism

19. Heart as a pump
20. Differences between left and right heart
21. Determinants of cardiac performance: preload, afterload, inotropy
22. Cardiac reserve. Heart failure.
23. Cardiac cycle. Phases. Pressure-volume loop.
24. Stroke volume and cardiac output
25. Heart sounds. Diagnostic significance.
26. Autoregulation of cardiac contraction: Starling principle
27. Autoregulation of cardiac contraction: frequency effect
28. Heart rate
29. Arrhythmias
30. Mechanism of re-entry
31. Athlete's heart
32. Coronary circulation
33. Coronary reserve. Ischaemic heart disease.
34. Cardiovascular system – general principles
35. Significance of Poiseuille-Hagen formula for blood flow
36. Vascular resistance
37. Blood pressure. Hypertension.
38. Arterial elasticity – significance
39. Arterial pulse wave
40. Physiological role of endothelium
41. Vasoactive substances
42. Micro-circulation
43. Venous pressure
44. Venous return. Venous stasis and embolism.
45. Lymphatic system
46. Pulmonary circulation
47. Cerebral circulation
48. Skin circulation
49. Muscle and splanchnic circulation
50. Placental and foetal circulation
51. Circulatory adjustments at birth
52. Intrapulmonary and pleural pressure. Pneumothorax.
53. Alveolar surface tension. Surfactant.
54. Compliance of lungs. Respiratory work.
55. Composition of atmospheric and alveolar air.
56. Gas exchange in lungs and tissues
57. Transport of O₂. Oxygen – haemoglobin dissociation curve.
58. Transport of CO₂
59. Herring-Breuer reflexes
60. Respiratory responses to irritants
61. Artificial ventilation
62. Formation, composition and functions of saliva
63. Gastric production of HCl
64. Functions of the stomach
65. Motility of gastrointestinal tract
66. Composition and function of pancreatic juice
67. Liver functions
68. Formation, composition and functions of bile
69. Digestion in the small intestine
70. Functions of colon
71. Resorption of lipids in the small intestine
72. Resorption of minerals and water in small intestine
73. Intermediary metabolism (overview)
74. Nitrogen balance
75. Metabolism of cholesterol. Atherosclerosis.
76. Metabolism of iron
77. Bone formation and resorption
78. Hyperthermia and hypothermia
79. Functional morphology of nephron
80. Urine formation
81. Renal blood flow and its autoregulation
82. Glomerular filtration
83. Function of renal tubules
84. Juxtaglomerular apparatus
85. Renal sodium transport, aldosterone
86. Passive transport in kidneys
87. Transport of glucose in kidneys
88. Urea formation
89. Hyper- and hypotonic urine. Counter-current system.
90. Osmotic and water diuresis
91. Micturition
92. Effects of thyroid hormones
93. Metabolism of iodine; Thyroid hormones synthesis
94. Hyper- and hypothyroidism
95. Endocrine pancreas
96. Insulin – mechanism of action
97. Hyper- and hypoglycaemia. Diabetes mellitus.
98. Adrenal cortex. Functions, malfunctions.
99. Metabolic and anti-inflammatory affects of glucocorticoids
100. Adrenal medulla. Synthesis of catecholamines.
101. Hypothalamo-pituitary system
102. Glandotropic hormones of anterior pituitary gland
103. Growth hormone and growth factors (IGF)
104. Formation and secretion of posterior pituitary hormones
105. Hypothalamic releasing hormones
106. Parathormone, vitamin D and calcitonin
107. Vasopressin and natriuretic hormone
108. Endorphins and enkephalins
109. Pineal gland. Circadian rhythm.
110. Ovarian cycle and its control
111. Uterine cycle
112. Physiology of pregnancy
113. Physiology of parturition and lactation
114. Endocrine functions of testes
115. Sex reflexes
116. Regulation of body fluid volume
117. Regulation of constant osmotic pressure
118. Regulation of calcium metabolism
119. Regulation of glycemia
120. Regulation of adrenal cortex