

Physiology 2013

Part A

1. Structure and function of cell membranes and organelles.
2. Passive transport across membranes. Co-transport
3. Compartmentalization of body fluids
4. Differences between intra- and extracellular fluids
5. Production and resorption of interstitial fluid (Starling forces)
6. Ion channels
7. Intercellular communication
8. Second messengers
9. Functions of the nerve cell
10. Functional morphology of synapses
11. Synthesis and break down of transmitters
12. Generation of resting membrane potential
13. Local response of membrane potential
14. Action potential
15. Up- and down-regulation of receptors
16. Excitability and refractoriness
17. Excitation-contraction coupling
18. Molecular mechanism of muscle contraction
19. Electrical and mechanical behaviour of skeletal muscle, cardiac muscle and smooth muscle
20. Isometric and isotonic contraction. Length-tension relation.
21. Neuromuscular junction
22. Energy production and conservation
23. Caloric content of food. Direct calorimetry. Energy balance. Indirect calorimetry.
24. Physiological role of calcium
25. Vitamins – overview
26. Hypovitaminoses and hypervitaminoses
27. Basal metabolism
28. Glycaemia
29. Acid-base balance
30. Hypoxia and ischemia
31. Hormone-receptor complex
32. Invasive assessment of blood pressure
33. Non-invasive assessment of blood pressure
34. Measurement of cardiac output
35. ECG leads
36. ECG record in different leads
37. Estimation of electric axis of the heart
38. Cardiac contractility, ejection fraction, heart failure
39. Polygraphic methods
40. Electromyography
41. External signs of breathing
42. Lung ventilation, volumes, measurement
43. Dead space, measurement
44. Resistance of airways, measurement
45. Pneumography and pneumotachography
46. Maximal respiratory flow – volume curve (spirogram)
47. pH measurement (Astrup method)
48. Clearance
49. Special methods of ECG and blood pressure examination (vectocardiography, 24-hour-monitoring, His bundle electrogram)
50. Reaction of circulatory system on bleeding
51. Reflex reactions of circulatory system (diving reflex, Valsalva manoeuvre, Müller manoeuvre)
52. Respiratory quotient
53. Cardiopulmonary response to exercise
54. Autocrine, paracrine, endocrine regulation
55. Chemical characteristics of hormones
56. Sympathetic alpha- and beta-receptors

57. Sex differentiation
58. Oogenesis and spermatogenesis
59. Hormonal contraception
60. Puberty and menopause
61. Physiological significance of positive and negative feed-back
62. Physiological regulations (overview)
63. Homeostasis
64. Regulation of constant pH
65. Kidney in regulation of homeostasis
66. Regulation of cardiac output
67. Regulation of blood circulation upon orthostasis
68. Regulation of ventilation
69. Regulation of gastric and pancreatic secretion
70. Co-ordination of GIT segments
71. Thermoregulation
72. Regulation of renal functions
73. General principles of endocrine regulation
74. Sympathetic nervous system (overview)
75. Parasympathetic nervous system (overview)
76. Integration of nervous and hormonal regulation
77. Regulation and adaptation

Part B

1. Blood composition – values
2. Red blood cell. Haemolysis.
3. Haemoglobin and its derivatives
4. Suspension stability of RBC (sedimentation rate)
5. Cellular immunity
6. Humoural immunity
7. Histocompatibility (MHC)
8. Blood groups antigens (ABO group, Rh group)
9. Function of platelets
10. Hemostasis
11. Anticlotting mechanism
12. Conduction system of the heart
13. Cardiac automaticity
14. Spread and retreat of excitation wavefront
15. Electric vector of the heart. Vectocardiography.
16. Heart as a pump
17. Differences between left and right heart
18. Determinants of cardiac performance: preload, afterload, inotropy
19. Cardiac reserve. Heart failure.
20. Cardiac cycle. Phases. Pressure-volume loop.
21. Stroke volume and cardiac output
22. Heart sounds. Diagnostic significance.
23. Autoregulation of cardiac contraction: Starling principle
24. Autoregulation of cardiac contraction: frequency effect
25. Heart rate
26. Arrhythmias
27. Coronary circulation
28. Coronary reserve. Ischaemic heart disease.
29. Cardiovascular system – general principles
30. Vascular resistance
31. Blood pressure. Hypertension.
32. Arterial elasticity – significance
33. Arterial pulse wave
34. Physiological role of endothelium
35. Micro-circulation
36. Venous pressure
37. Venous return. Venous stasis and embolism.
38. Lymphatic system
39. Pulmonary circulation
40. Cerebral circulation

41. Skin circulation
42. Muscle and splanchnic circulation
43. Placental and faetal circulation
44. Circulatory adjustments at birth
45. Intrapulmonary and pleural pressure. Pneumothorax.
46. Alveolar surface tension. Surfactant.
47. Composition of atmospheric and alveolar air.
48. Gas exchange in lungs and tissues
49. Transport of O₂. Oxygen – haemoglobin dissociation curve.
50. Transport of CO₂
51. Herring-Breuer reflexes
52. Respiratory responses to irritants
53. Formation, composition and functions of saliva
54. Gastric production of HCl
55. Functions of the stomach
56. Motility of gastrointestinal tract
57. Composition and function of pancreatic juice
58. Liver functions
59. Formation, composition and functions of bile
60. Digestion in the small intestine
61. Functions of colon
62. Resorption of lipids in the small intestine
63. Resorption of minerals and water in small intestine
64. Intermediary metabolism (overview)
65. Nitrogen balance
66. Metabolism of cholesterol. Atherosclerosis.
67. Metabolism of iron
68. Functional morphology of nephron
69. Urine formation
70. Renal blood flow and its autoregulation
71. Glomerular filtration
72. Function of renal tubules
73. Juxtaglomerular apparatus
74. Renal sodium transport, aldosterone
75. Passive transport in kidneys
76. Transport of glucose in kidneys
77. Urea formation
78. Hyper- and hypotonic urine. Counter-current system.
79. Osmotic and water diuresis
80. Micturition
81. Effects of thyroid hormones
82. Metabolism of iodine; Thyroid hormones synthesis
83. Hyper- and hypothyroidism
84. Endocrine pancreas
85. Insulin – mechanism of action
86. Hyper- and hypoglycaemia. Diabetes mellitus.
87. Adrenal cortex. Functions, malfunctions.
88. Metabolic and anti-inflammatory affects of glucocorticoids
89. Adrenal medulla. Synthesis of catecholamines.
90. Hypothalamo-pituitary system
91. Glandotropic hormones of anterior pituitary gland
92. Growth hormone and growth factors (IGF)
93. Formation and secretion of posterior pituitary hormones
94. Hypothalamic releasing hormones
95. Parathormone, vitamin D and calcitonin
96. Vasopressin and natriuretic hormone
97. Ovarian cycle and its control
98. Uterine cycle
99. Physiology of pregnancy
100. Physiology of parturition and lactation
101. Endocrine functions of testes
102. Regulation of body fluid volume
103. Regulation of constant osmotic pressure