

Physiology: spring semester 2016

Part A

1. Structure and function of cell membranes and cell organelles
2. Transport across membranes.
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. Functions of the nerve cell
9. Functional morphology of synapses
10. Generation of resting membrane potential
11. Local response of membrane potential. Action potential
12. Excitability and refractoriness
13. Excitation-contraction coupling
14. Molecular mechanism of muscle contraction
15. Electrical and mechanical behaviour of various types of muscle
16. Isometric and isotonic contraction. Length-tension relation.
17. Neuromuscular junction
18. Energy metabolism and its measurement
19. Physiological role of calcium
20. Vitamins
21. Regulation of food intake and its disorders
22. Hypoxia and ischemia
23. Physiological applications of law of Laplace
24. Lung ventilation, volumes, measurement. Dead space.
25. Maximal respiratory flow – volume curve (spirogram)
26. Respiratory quotient
27. Cardiopulmonary response to exercise
28. Physiological significance of positive and negative feed-back
29. Physiological regulations (overview)
30. Homeostasis
31. Functional morphology of nephron
32. Tubular processes, tubular reabsorption and secretion, urine formation
33. Renal blood flow and its autoregulation
34. Glomerular filtration, principals and regulation. Juxtaglomerular apparatus
35. Renal sodium, potassium, chlorid transports, their regulation
36. Urea formation
37. Water resorption, hyper- and hypotonic urine. Counter-current system.
38. Osmotic, water and pressure diuresis
39. Examination of renal function. Clearance
40. Micturition
41. Metabolic and endocrine renal function
42. Kidney in regulation of homeostasis
43. Alveolar surface tension. Surfactant.
44. Composition of atmospheric and alveolar air. Gas exchange in lungs and tissues
45. Transport of O₂. Oxygen – haemoglobin dissociation curve. Transport of CO₂
46. Regulation of ventilation
47. Respiratory responses to irritants
48. Formation, composition, functions and regulation of saliva
49. Formation, composition, functions and regulation secretion of gastric secretion
50. Functions of the stomach
51. Formation, composition, functions and regulation of pancreatic juice
52. Motility of gastrointestinal tract
53. Co-ordination of GIT segments
54. Liver functions
55. Formation, composition, functions and regulation of bile
56. Digestion and resorption in the small intestine
57. Functions of colon
58. Sympathetic nervous system (overview)
59. Parasympathetic nervous system (overview)
60. Integration of nervous and hormonal regulation
61. 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. Mechanism of innate immunity
6. Acquired immunity
7. Blood groups antigens
8. Function of platelets
9. Hemocoagulation
10. Anticlotting mechanism
11. Conduction system of the heart
12. Cardiac automaticity
13. Spread and retreat of excitation wavefront. Electric vector of the heart
14. Cardiovascular response to haemorrhage
15. Non-invasive assessment of blood pressure
16. ECG leads. ECG record in different leads
17. Estimation of electric axis of the heart
18. Cardiac contractility and its determination
19. Differences between left and right heart
20. Determinants of cardiac performance: preload, afterload, inotropy
21. Cardiac reserve. Heart failure.
22. Cardiac cycle. Phases. Pressure-volume loop.
23. Heart sounds. Diagnostic significance.
24. Starling principle (heterometric autoregulation of cardiac contraction)
25. Frequency effect (homeometric autoregulation of cardiac contraction)
26. Heart rate
27. Regulation of heart function
28. Coronary circulation. Coronary reserve. Ischaemic heart disease.
29. Cardiovascular system – general principles
30. Vascular resistance
31. Blood pressure. Hypertension.
32. Arterial elasticity – significance
33. Arterial pulse, pulse wave
34. Physiological role of endothelium. Vasoactive substances
35. Micro-circulation
36. Venous pressure. Venous return. Venous stasis and embolism.
37. Lymphatic system
38. Pulmonary circulation
39. Cerebral circulation
40. Skin circulation
41. Muscle and splanchnic circulation
42. Regulation of blood circulation upon orthostasis
43. Placental and faetal circulation. Circulatory adjustments at birth

44. Autocrine, paracrine, endocrine regulation
45. General principles of endocrine regulation
46. Chemical characteristics of hormones
47. Effect of hormones on target cells
48. Second messengers
49. Hypothalamo-pituitary system
50. Prolaktin.
51. Glandotropic hormones of anterior pituitary gland
52. Growth hormone and growth factors (IGF)
53. Formation and secretion of posterior pituitary hormones
54. Thyroid hormones. Regulation and dysregulation.
55. Endocrine pancreas
56. Insulin and mechanism of its action
57. Glycaemia, its regulation and dysregulation
58. Adrenal cortex. Functions, malfunctions.
59. Metabolic and anti-inflammatory affects of glucocorticoids
60. Adrenal medulla. Synthesis and degradation of catecholamines.
61. Bone formation and resorption. Regulation of calcaemia.
62. Natriuretic peptides
63. Pineal gland. Circadian rhythm.
64. Puberty and menopause
65. Cyclic changes in non-pregnant women
66. Physiology of pregnancy
67. Physiology of parturition and lactation
68. Principals of hormonal contraception
69. Endocrine functions of testes, its regulation
70. Regulation of body fluid volume
71. Regulation of constant osmotic pressure