

**Physiology II Div., Preclinical Department, 2nd Year English Module
Academic Year 2011/2012**

Subjects for 1st Semester - NERVOUS SYSTEM & CARDIOVASCULAR PHYSIOLOGY

1. Nervous cells: types, characteristics, functions, distribution.
2. Neuron: structure and compartmentalization; classification; axoplasmic transport
3. Cell membrane potential: Nernst potential; Resting membrane potential
4. Voltage-Gated ion channels (Na, K, Ca voltage-gated ion channels);
5. Ligand-gated ion channels (glutamate receptors, Ach receptors)
6. Explain the differences between ionotropic and metabotropic receptors
7. Membrane responses to stimulus current: hyperpolarization current, depolarization current, threshold current, current propagation
8. Nerve action potential (AP): phases, ionic conductance during AP, membrane refractoriness
9. Axon depolarization and AP propagation; myelin; saltatory conduction
10. Electrical synapse: structure, function, occurrence in the nervous system
11. Chemical synapse: structure and function; neurotransmitters
12. Chemical synapse: Presynaptic mechanisms - mechanism of transmitter release; presynaptic inhibition.
13. Chemical synapse: Postsynaptic mechanisms: ionotropic, metabotropic;
14. Control of transmitter activity in the synaptic cleft;
15. Fast or slow synapses; explain the differences between fast and slow chemical synapses
16. Glutamate, GABA
17. Norepinephrine, Acetylcholine, Nitric oxide
18. Dopamine, Serotonin
19. Regulation of chemical synapse function by neuron – astroglia connections
20. Excitatory and inhibitory postsynaptic potentials
21. Spatial and temporal summation of postsynaptic potential
22. Neuromuscular junction
23. The motor unit of the skeletal muscle.
24. Skeletal muscle contraction;
25. Excitation-contraction coupling in the skeletal muscle;
26. Eye components and their function
27. Accommodation
28. The lens system of the eye; fovea and the focal point; emmetropia and errors of refraction
29. Visual acuity;
30. Photopic and scotopic vision
31. Fluid system of the eye
32. Cellular organization of the retina
33. Color vision
34. Ears components and their function; Corti organ
35. Transmission of sound to the hair cells; hair cells innervation; signal transduction
36. Classification of the sensory receptors
37. Pain receptors; types of pain
38. Mechanism of stimulation of taste buds
39. Mechanism of excitation of the olfactory cells: signal transduction
40. Components of the cardiovascular system and their function
41. Blood distribution in the cardiovascular system
42. Particularities of the cardiac muscle; myocardial cell structure; myocardial properties
43. Morphological components of the heart; cell types & their function; valves of the heart & their function
44. Myocardial action potentials
45. Ionic conductivity during action potentials at myocardial cell level
46. Cardiac automaticity; specialized excitatory system; autonomic nervous system effects on automatism
47. Refractory periods of the myocardium and their significance
48. Calcium transport systems in myocardial fiber; Na⁺/Ca²⁺ exchanger

49. Myocardial conductivity; excito-conductive system of the heart
50. Conduction velocity of AP in the heart; autonomic nervous system effects on conduction velocity
51. Cardiac cycle (CC phases, AS, AD, VS, VD)
52. Heart sounds; phonocardiography
53. Excitation-contraction coupling in cardiac muscle
54. Myocardial contractility (inotropism)
55. Ventricular volumes; pressures in the right and left heart
56. Preload and the Frank-Starling law of the heart
57. Afterload and contractility as parameters of the systolic function
58. Pressure-volume loop and its behavior with increased preload, afterload, contractility
59. Inotropic agents (positive, negative)
60. Diastolic function
61. Work of the heart and tension heat
62. Coronary blood flow
63. Regulation of coronary blood flow
64. Myocardial oxygen demand
65. Myocardial metabolism
66. Relationship between ventricular AP and QRS – T on ECG
67. The ECG lead systems
68. Atrial activation and P wave characteristics
69. Ventricular activation and the QRS complex
70. ECG intervals (PR, QT)
71. Atrial recovery; ventricular recovery and the T wave
72. Rhythm analysis (steps and NSR parameters)
73. QRS axis
74. Blood flow in systemic circulation
75. Pressure inside the vessels – definition, pressure differences
76. Factors that generate pressure in the circulation
77. Vascular resistance to blood flow – definition, dependence on r and on type of connection between vessels (series, parallel); resistance and vasomotion
78. Viscous resistance and whole blood viscosity
79. Vascular distensibility, vascular compliance and vascular structure-function relationship
80. Pulse pressure (definition, variation); pressure pulse transmission and damping; mean arterial pressure
81. Pressure profiles along systemic and pulmonary circulation
82. Systemic veins – roles
83. Central and peripheral venous pressures
84. Roles of lymphatic system; formation of lymph
85. Lymph flow (rate, lymphatic pump)
86. Microcirculation – definition, structure
87. Capillary exchange of solutes
88. Capillary exchange of water and the Starling forces
89. Capillary fluid filtration, capillary fluid reabsorption and the Starling equilibrium for capillary exchange
90. Interstitial edema
91. Short-term control of microcirculation – metabolic and endothelial factors
92. Autoregulation of microcirculation
93. Baroreceptor reflex – receptors, afferents, medullary center
94. Baroreceptor reflex - efferents, effectors
95. Baroreceptor control of blood pressure
96. Effects of sympathetic and parasympathetic on cardiovascular system
97. Chemoreceptor control of blood pressure
98. Low-pressure baroreceptor control of blood pressure
99. Regulation of cardiac output
100. Intermediate and long-term control of the circulation