

Neurosciences

Examination topics for the state doctoral examination

1. Structure and function of the cell membrane
2. Membrane transport
3. Nerve cell excitability and ion channels
4. Membrane and action potential
5. Impulse conduction in nerve fibres
6. Glial cells and their functions
7. Structure and function of the synapses
8. Synaptic receptors
9. Overview of mediators
10. The role of acetylcholine at the neuromuscular junction and in the CNS
11. Catecholamine mediators, serotonin
12. Opioid peptides and their receptors
13. Neuropeptides and functions of the hypothalamus
14. Excitatory aminoacids as synaptic mediators
15. Glutamate receptors
16. GABA and glycine
17. Nitrogenoxide and its role in the CNS
18. G proteins and cyclic nucleotides in the CNS
19. Protein phosphorylation and regulation of the functions of the nervous system
20. Axonal transport
21. Development of the CNS and neural crest – the role of genes
22. Neural plasticity and regulation

23. The effect of ageing on the nervous system
24. Cerebrospinal fluid and blood-brain-barrier
25. Blood circulation in the brain and energy metabolism of the brain
26. Extracellular space of the CNS
27. Structure and functions of the peripheral nervous system
28. Structure and functions of the spinal cord
29. Structure and functions of the vegetative nervous system
30. Sensory functions, overview, general characteristics of receptors
31. Somatosensory system
32. Pain
33. Eye – receptors and nerve cells
34. Anatomy and physiology of the central visual system
35. Hearing – the inner ear and the central auditory system
36. Vestibular system
37. Chronobiology
38. The motor system of the brain
39. The control of movement – the role of the basal ganglia and the cerebellum
40. The brain and emotions – the role of the limbic system
41. The brain cortex and the integrative functions of the CNS
42. The role of the thalamus
43. The electric activity of the brain – electroencephalography (EEG)
44. The electric activity of the brain – slow (evoked) potentials
45. The electric activity of the brain – evoked potentials
46. Functional brain imaging techniques
47. Recording of neuronal and glial activity – extracellular and intracellular recordings

48. Sleep and wakefulness – their regulation and relation to basic physiological functions
49. Ion-selective microelectrodes, the principles of their function and use
50. Brain sections, the principle of the method and its use
51. Basics of brain anatomy
52. Disorders of speech and gnosis
53. Neurophysiology of learning and memory
54. Ischaemia and hypoxia of the CNS
55. Epilepsy
56. Disorders of the basal ganglia and their mediators
57. Alzheimer's disease
58. The biochemical aspects of mental disorders
59. Behavioural models of learning and memory
60. Neuroendocrinology
61. Disorders of synaptic transmission at the neuromuscular junction
62. The effects of toxic substances on the nervous system
63. Demyelinating diseases
64. Psychiatric diseases – basic characteristics
65. Disorders of sleep and wakefulness
66. Stereotaxy of the CNS, Gamma Knife radiosurgery

Recommended literature

- Kalat JW. *Biological Psychology*. Belmont, Calif: Wadsworth, Cengage Learning, 2009.
- Snell RS. *Clinical Neuroanatomy for Medical Students*. 5th Edition. Lippincott, Williams and Wilkins, 2001.
- Brodal P. *The Central Nervous System*. 3rd Edition. Oxford University Press, 2004.
- Purves D. et al.: *Neuroscience*. 2nd Edition, Sinauer Assoc. Sunderland, 2001.
- Rosenzweig MR et al. *Biological Psychology*. 3rd Edition, Sinauer Assoc. Sunderland, 2002.
- Cooper JR et al. *The Biochemical Basis of Neuropharmacology*. 8th Edition, Oxford University Press, 2003.
- Balazs B, Bridges RJ, and Cotman CW. *Excitatory Amino Acid Transmission in Health and Disease*. Oxford University Press, 2006.