

**BHARATI VIDYAPEETH**  
**(DEEMED TO BE UNIVERSITY), PUNE, INDIA**  
**PhD Entrance Test – 2022**  
**SECTION-II: Neurology - 50 Marks**

**Basic Sciences**

Neuroanatomy-

Embryonic development and Structure of CNS, PNS, coverings of the nervous system, blood brain barrier. Functions, Connections, applied anatomy including CT and MR anatomy blood supply and their perturbations in health and disease.

Neurophysiology, Neurochemistry and genetics-

1. Structure and Function of Neural Membranes, including cell membrane structure and function, membrane transport, various types of ion channels, electrical excitability of cell membrane, lipid biochemistry, structure and function of myelin, biochemistry of myelin. Applied aspects like pathogenesis of various diseases involving myelin, various channelopathies etc.
2. Synaptic Transmission, including structure and function of synapse, various types of receptors and signal transduction, G-Proteins and cyclic nucleotides, classes of neurotransmitters, individual neurotransmitters like acetyl choline, catecholamines, serotonin, histamine, opioids, neuropeptides, excitatory amino acids, GABA and glycine, purines, phosphoinositides and eicosanoids, protein phosphorylation and regulation of neuronal function. Applied aspects like neurochemistry of drug abuse, neurotransmitter disorders of basal ganglia, neurochemistry of degenerative diseases like Alzheimer's disease and Parkinson's disease, neurochemistry of epilepsy and anti-epileptic drugs. Biochemistry of vision, olfaction and taste sensations.
3. Muscle Fibre structure, various structural and functional proteins in the muscle fibres. Applied aspects like the genetics and pathogenesis of muscular dystrophies.
4. Axonal transport, neuronal cytoskeleton, development of nervous system, neural plasticity, biochemistry of aging, circulation and energy metabolism in the brain, neuronal hypoxia and ischemia, blood-brain barrier.
5. Disorders of carbohydrate, fatty acid and amino acid metabolism, mitochondrial disorders, urea cycle and its disorders, organic acid disorders, vitamin and other nutritional deficiencies, genetic disorders of lipid, glycoprotein and mucopolysaccharide metabolism, metabolic encephalopathy, biochemistry of psychiatric disorders, biochemistry of learning and memory, relation between endocrine system and nervous system.
6. Molecular basis of heredity, structure and function of DNA RNA, polypeptides and proteins, gene structure and organization, processing of RNA, imprinting and X-inactivation, cell cycle, chromosomal basis of heredity, organization of human genome, mitochondrial genome, genetic polymorphism, the human genome project, technology of cytogenetics and molecular genetics, methods of mutation detection / detecting specific sequence changes, DNA methylation analysis, abnormalities of chromosome number and structure, specific types of chromosome rearrangements, cytogenetic nomenclature, mutation and genetic disorders, types of mutations, effects of mutation on gene function, patterns of inheritance, genetic counselling, genetics of common neurological disorders.

### Microbiology and Pathology-

Infectious agents responsible for nervous system diseases, pathogenesis, consequences and applied aspects including diagnostic tools, their applications and limitations. Pathology of various central and peripheral nervous system disorders - like demyelination, vasculitis, infections, their recognition on gross specimens, basis of tissue preparation, stains, Interpretation of brain, nerve and muscle biopsy specimens, including special studies like immunohistochemistry and EM.

### Neuropharmacology-

Basic pharmacology of drugs used in various neurological disorders- epilepsy, parkinsonism, vascular diseases, myasthenia, migraine dementia, drugs used in critical care with special emphasis on pathophysiology of disease, mechanism of action, interactions, adverse effects, features of poisoning/overdose. Newer drug delivery systems and recent advances.

### Others-

1. Fundamentals of Neuropsychology
2. Neuro-Ophthalmology: Ocular Motor System , Afferent Visual System
3. Neuro-Otology
4. Neurourology
5. Neuroepidemiology
6. Clinical Neurogenesis Neuroimmunology, Neuro virology, Neuroendocrinology

Syllabus: Part II to be acquired by 36 months

### **Approach to Common Neurological Problems**

Diagnosis of Neurological Disease-bed-side clinical evaluation-

Model history taking and comprehensive neurological examination- Focus on clinical demonstrations with ideal techniques and bed-side manners. General physical and systemic examination with focused methodology to evaluate each part of the neuraxis so as to present his evaluation as Anatomical, Patho-physiological and Clinical diagnosis.

### Syndromic approach-

For diagnosis of neurological diseases. Familiar with Approach to common and uncommon clinical problems like Episodic Impairment of Consciousness, Falls and Drop Attacks, Delirium, Stupor and Coma, Intellectual and Memory Impairments, Global Developmental Delay and Developmental Regression, Behavior and Personality Disturbances, Depression and Psychosis in Neurological Practice, Intentional Motor Disorders and the Apraxias. The Agnosias, Language and Speech Disorder-Aphasia, Dysarthria and Apraxia of Speech, Neurogenic Dysphagia, Vision Loss, Abnormalities of the Optic Nerve and Retina, Eye Movement Disorders: Diplopia, Nystagmus and other Ocular Oscillations, Pupillary and Eyelid Abnormalities, Dizziness and Vertigo Hearing Loss and Tinnitus, Disturbances of Taste and Smell, Cranial and Facial Pain, Brainstem Syndromes, Ataxic Disorders, Movement Disorders: Diagnosis and Assessment ,Gait Disorders Hemiplegia and Monoplegia, Paraplegia and Spinal Cord Syndromes, Proximal, Distal and Generalized Weakness, Muscle Pain and Cramps, The Floppy Infant, Sensory Abnormalities of the Limbs, Trunk, and Face Neurological Causes of Bladder, Bowel and Sexual Dysfunction, Arm and Neck Pain, Lower Back and Lower Limb Pain.

## **Neurological Investigations and Related Clinical Neurosciences**

Laboratory Investigations in Diagnosis and Management of Neurological Disease Clinical Neurophysiology-their performance and interpretation Electroencephalography and Evoked Potentials, Clinical Electroneuro myography Neuroimaging-Structural Neuroimaging-Computed Tomographic and Magnetic Resonance, Vascular Imaging, Neuroangiographic Anatomy and Common Cerebrovascular Diseases Ultrasound Imaging of the Cerebral Vasculature Functional Neuroimaging.

## **Management of Neurological Disease and recent advances**

Principles of Neuropharmacology and Therapeutics, Principles of Pain Management, Principles of Neuro intensive Care , Principles of Neurosurgery, Principles of Endovascular Surgery, Principles and Practices of Neurological Rehabilitation.

## **Neurological Diseases, clinical features, evaluation and management of:**

1. Neurological Complications of Systemic Disease in adults and children.
2. Trauma of the Nervous System.
3. Vascular Diseases of the Nervous System-ischemic cerebrovascular disease, Intracerebral Hemorrhage, Intracranial Aneurysms and Subarachnoid Hemorrhage, Arteriovenous Malformations, Stroke in Children, Spinal Cord Vascular Disease and Central Nervous System Vasculitis and other rare disorders- pathophysiology, features and management.
4. Cancer and the Nervous System.
5. Epidemiology of Primary Brain Tumors.
6. Clinical Features and Complications, Neuroimaging, Management of Primary Nervous System Tumors in Adults and Infants and Children.
  - i) Nervous System Metastases and Paraneoplastic Disorders of the Nervous System.
  - ii) Infections of the Nervous System.
7. Bacterial Infections, Viral Infections, Fungal Infections, Parasitic Infections, Neurological Manifestations of Human Immunodeficiency Virus Infection in Adults and children, Prion Diseases.
8. Multiple Sclerosis and Other Inflammatory Demyelinating Diseases of the Central Nervous System.
9. Hypoxic/Anoxic and Ischemic Encephalopathies.
10. Toxic and Metabolic Encephalopathies.
11. Deficiency Diseases of the Nervous System.
12. Effects of Toxins and Physical Agents on the Nervous System.
13. Brain Edema and Disorders of Cerebrospinal Fluid Circulation.
14. Developmental Disorders of the Nervous System.
15. Developmental Disabilities.
16. Inborn Errors of Metabolism of the Nervous System, Mitochondrial Disorders and Channelopathies: Episodic and Electrical Disorders of the Nervous System.
17. Neurocutaneous Syndromes.
18. The Dementias.
19. The Epilepsies.
20. Sleep and Its Disorders.
21. Headache and Other Craniofacial Pain.
22. Cranial Neuropathies.

23. Movement Disorders.
24. Disorders of the Cerebellum, Including the Degenerative Ataxias.
25. Disorders of Bones, Joints, Ligaments, and Meninges.
26. Disorders of Upper and Lower Motor Neurons.
27. Disorders of Nerve Roots and Plexuses.
28. Disorders of Peripheral Nerves.
29. Disorders of the Autonomic Nervous System.
30. Disorders of Neuromuscular Transmission.
  - i) Disorders of Skeletal Muscle.
31. Neurological Problems of the Newborn.
32. Neurological Problems of Pregnancy.

#### Syllabus for research methodology

1. Research Question
2. Specifications of Study subjects, sampling and Recruitment
3. Planning the Measurements, Precision and accuracy
4. Hypothesis and Sample size
5. Estimating sample size and Power
6. Designing a Cohort study
7. Designing cross-sectional and Case-Control Studies
8. Designing a RCT
9. Designing studies of Medical tests
10. Ethical issues
11. Designing surveys
12. Data management
13. Implementing the study and quality control
14. Writing and Funding a Research Proposal