# American Board of Psychiatry and Neurology, Inc.

A Member Board of the American Board of Medical Specialties (ABMS)

**CERTIFICATION EXAMINATION IN CLINICAL NEUROPHYSIOLOGY**
**2019 Content Blueprint**
(January 3, 2019)

| **Number of questions: 220** | | **Percent** |
|---|---|---|
| 01. | EEG | 32-38% |
| 02. | NCS/EMG | 32-38% |
| 03. | Other CNP | 14-18% |
| 04. | Basic Science | 12-16% |
| TOTAL | | 100% |

**CERTIFICATION EXAMINATION IN CLINICAL NEUROPHYSIOLOGY**
**2019 Content Outline**

| | | | | |
|---|---|---|---|---|
| **01.** | **EEG** | | | |
| | A. | Methods | | |
| | | 1. | Techniques—activation | |
| | | | a. | Hyperventilation |
| | | | b. | Photic stimulation |
| | | | c. | Sleep deprivation |
| | | | d. | Sedation |
| | | | e. | Supplementary electrodes |
| | | | f. | Video use |
| | | | g. | Response testing/interviewing |
| | | | h. | Reactivity |
| | | | i. | Cerebral death criteria |
| | | | j. | Electrode placement |
| | | | k. | Trendline/quantification |
| | | | l. | Montage selection |
| | | | m. | MEGs |
| | | | n. | Electrocorticography/cortico-mapping |
| | | | o. | Other (applications/indications and limitations of ambulatory EEG, scalp video EEG, and intracranial EEG monitoring) |
| | | 2. | Artifacts | |
| | | | a. | Electrode pop |
| | | | b. | Photoelectric |
| | | | c. | Salt bridge |
| | | | d. | Movement |
| | | | e. | Muscle |
| | | | f. | Eye movements/eye flutter |
| | | | g. | Rectus muscle spicules |
| | | | h. | Interelectrode distance errors |
| | | | i. | Glossopharyngeal |
| | | | j. | Machine/ventilator |
| | | | k. | 60 Hz |
| | | | l. | Dissimilar metals |
| | | | m. | Bruxism |
| | | | n. | Fluid collection |
| | | | o. | Breach rhythm/skull defect |

| | | | | |
|---|---|---|---|---|
| | | p. | Sweat artifact | |
| | | q. | Suck artifact | |
| | | r. | Pulse artifact | |
| | | s. | ECG | |
| | | t. | Other artifacts (e.g., bed motion, patting, IV drip, ICU artifacts) | |
| B. | Basic patterns | | | |
| | 1. | Maturational, state, and age-related changes | | |
| | | a. | Premature neonate | |
| | | | i. | Trace discontinue |
| | | | ii. | Positive temporal theta bursts |
| | | | iii. | Delta brush |
| | | | iv. | Synchrony |
| | | | v. | Inter burst interval duration |
| | | b. | Term neonate | |
| | | | i. | Trace alternant/quiet sleep |
| | | | ii. | Activitè moyenne/wakefulness |
| | | | iii. | Multifocal sharps/quiet sleep |
| | | | iv. | High voltage slow/quiet sleep |
| | | | v. | Central apnea |
| | | | vi. | Active sleep |
| | | | vii. | Wakefulness |
| | | | viii. | Encoches frontales |
| | | c. | Infant patterns | |
| | | | i. | Sleep spindles |
| | | | ii. | NREM sleep: other |
| | | | iii. | REM sleep |
| | | | iv. | Waking posterior rhythm |
| | | d. | Childhood | |
| | | | i. | Waking posterior rhythm |
| | | | ii. | Central theta |
| | | | iii. | NREM sleep: hypnogogic |
| | | | iv. | NREM sleep: arousals |
| | | | v. | Posterior slow waves of youth |
| | | e. | Adult | |
| | | | i. | Posterior waking rhythm |
| | | | ii. | Mu |
| | | | iii. | Beta |
| | | | iv. | NREM |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | v. | REM | |
| | | | | vi. | Lambda | |
| | | | | vii. | POSTs | |
| | | | f. | Elderly | | |
| | | | | i. | Temporal theta | |
| | | | | ii. | Slowing of alpha rhythm | |
| | | | | iii. | Diminished amplitude | |
| | | 2. | Variants—normal and uncommon | | | |
| | | | a. | Benign epileptiform sharp transients | | |
| | | | | i. | RMTD/psychomotor variant | |
| | | | | ii. | SSS/BETS | |
| | | | | iii. | Wicket spikes | |
| | | | | iv. | 6-14 | |
| | | | | v. | SREDA | |
| | | | | vi. | Midline theta rhythm | |
| | | | b. | Alpha rhythm variants | | |
| | | | | i. | Slow and fast | |
| | | | | ii. | Squeak | |
| | | | | iii. | Asymmetry | |
| | C. | Clinical correlations | | | | |
| | | 1. | Seizures and other paroxysmal events | | | |
| | | | a. | Focal | | |
| | | | | i. | By EEG findings | |
| | | | | | aa. | Ictal discharges |
| | | | | | bb. | Interictal discharges |
| | | | | | | xa. Focal spikes |
| | | | | | | xb. TIRDA |
| | | | | | | xc. OIRDA |
| | | | | | cc. | Neonatal seizures |
| | | | | ii. | By specific epilepsy syndrome | |
| | | | | | aa. | Rolandic/BECTS |
| | | | | | bb. | Panayiotopoulos/BOEC |
| | | | | | cc. | Other benign |
| | | | | | dd. | MTLE |
| | | | | | ee. | Rasmussen |
| | | | | | ff. | Other focal |
| | | | | | gg. | Focal NCSE/EPC |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | hh. | Landau-Kleffner syndrome/electrical status epilepticus in sleep | |
| | | b. | Generalized | | | |
| | | | i. | By EEG findings | | |
| | | | | aa. | Photoparoxysmal responses | |
| | | | | bb. | Polyspike and wave | |
| | | | | cc. | Generalized fast activities/tonic seizures | |
| | | | | dd. | Electrodecremental seizures | |
| | | | | ee. | 3-cps spike-wave | |
| | | | ii. | By specific epilepsy syndrome | | |
| | | | | aa. | Epileptic encephalopathies | |
| | | | | | xa. | Ohtahara/burst suppression |
| | | | | | xb. | West/hypsarrhythmia |
| | | | | | xc. | LGS/slow spike-wave |
| | | | | | xd. | Doose syndrome |
| | | | | | xe. | Angelman syndrome |
| | | | | | xf. | Dravet syndrome |
| | | | | bb. | Idiopathic generalized | |
| | | | | | xa. | Childhood absence |
| | | | | | xb. | JME |
| | | | | | xc. | Other idiopathic |
| | | | | cc. | Other generalized/multifocal | |
| | | | | dd. | NCSE/ictal stupor/spike wave stupor | |
| | | c. | Nonepileptic events | | | |
| | | | i. | Syncope/cardiac | | |
| | | | ii. | Psychogenic nonepileptic | | |
| | | | iii. | Other | | |
| | 2. | Focal lesions | | | | |
| | | a. | IRDA | | | |
| | | b. | ADA | | | |
| | | c. | Sporadic theta/delta | | | |
| | | d. | Focal suppression | | | |
| | 3. | Diffuse encephalopathies: coma, death | | | | |
| | | a. | Alpha rhythm slowing | | | |
| | | b. | Reactive theta/delta | | | |
| | | c. | Triphasic waves | | | |
| | | d. | IRDA | | | |
| | | e. | ADA | | | |

| | | | |
|---|---|---|---|
| | | f. | Alpha/theta coma |
| | | g. | Spindle coma |
| | | h. | Burst-suppression |
| | | i. | Cerebral death |
| | | j. | FIRDA |
| | | k. | Extreme delta brushes |
| | | l. | Neonatal encephalopathies (incl. periventricular hemorrhage) |
| | 4. | Drugs and treatment effects | |
| | | a. | Enhanced beta |
| | | b. | Slowing |
| | | c. | Epileptiform/seizure activation |
| | | d. | Hypothermic therapy effects |
| | 5. | Periodic and uncertain patterns | |
| | | a. | Focal or lateralized periodic |
| | | | i. HSV |
| | | | ii. Stroke |
| | | | iii. GBM |
| | | | iv. other focal |
| | | b. | Generalized or bilateral periodic |
| | | | i. Hypoxia/anoxia (adult/neonate) |
| | | | ii. Prion |
| | | | iii. Neonatal BERDs |
| | | | iv. Other generalized periodic (e.g., SSPE) |
| | | c. | Status epilepticus |
| | | d. | ICU-EEG terminology/ictal-interictal continuum |

| | | | |
|---|---|---|---|
| **02.** | **NCS/EMG** | | |
| A. | Methods | | |
| | 1. | Anatomy | |
| | 2. | Techniques | |
| | | a. | NCS |
| | | b. | EMG |
| | | c. | Repetitive stimulation |
| | | d. | SFEMG |
| B. | Basic patterns | | |
| | 1. | NCS | |
| | | a. | Normal |

| | | | | | |
|---|---|---|---|---|---|
| | | | | i. | Pediatric normal patterns |
| | | | b. | Abnormal | |
| | | | | i. | Neuropathic |
| | | | | ii. | Myopathic |
| | | | | iii. | Other |
| | | 2. | EMG | | |
| | | | a. | Normal | |
| | | | | i. | Pediatric normal patterns |
| | | | b. | Abnormal | |
| | | | | i. | Neuropathic |
| | | | | ii. | Myopathic |
| | | | | iii. | Other |
| | | 3. | Repetitive stimulation | | |
| | | 4. | Artifacts/Technical problems | | |
| | | | a. | NCS (stimulation/recording) | |
| | | | b. | Physiologic (e.g., temperature) | |
| | | | c. | Needle examination technique | |
| | | | d. | EMG waveform artifacts (e.g., pacemaker) | |
| | | | e. | Artifacts in the ICU | |
| | C. | Clinical correlations | | | |
| | | 1. | Peripheral nerve disease | | |
| | | | a. | Diffuse axon loss | |
| | | | | i. | Sensorimotor |
| | | | | ii. | Motor neuropathy |
| | | | | iii. | Sensory neuropathy/ganglionopathy |
| | | | | iv. | Pediatric axonal (e.g., Friedreich ataxia) |
| | | | b. | Diffuse demyelinating | |
| | | | | i. | Inherited (e.g., CMT, HNPP), adult |
| | | | | ii. | Acquired (e.g., AIDP, CIDP, MAG, multifocal motor neuropathy with conduction block) |
| | | | | iii. | Pediatric (e.g., CMT1A, CMT3, metachromatic leukodystrophy, adrenoleukodystrophy) |
| | | | c. | Focal | |
| | | | | i. | Mononeuropathy |
| | | | | | aa. Median neuropathy at wrist (CTS) |
| | | | | | bb. Ulnar neuropathy at elbow |
| | | | | | cc. Ulnar neuropathy at wrist |
| | | | | | dd. Radial neuropathy |

| | | | | |
|---|---|---|---|---|
| | | | ee. | Other upper limb mononeuropathy (e.g., musculocutaneous, suprascapular, axillary, proximal median) |
| | | | ff. | Fibular/peroneal |
| | | | gg. | Tibial |
| | | | hh. | Femoral |
| | | | ii. | Sciatic |
| | | ii. | Plexopathy | |
| | | | aa. | Brachial |
| | | | bb. | Lumbosacral |
| | | | cc. | Pediatric plexopathy (e.g., obstetric) |
| | | iii. | Root/radiculopathy | |
| | | | aa. | Lumbosacral |
| | | | bb. | Cervical |
| | | | cc. | Thoracic |
| | d. | Multifocal | | |
| | | i. | Mononeuropathy multiplex | |
| | | ii. | Polyradiculopathy (cauda equina, infectious, inflammatory, infiltrative) | |
| | | iii. | Polyradiculoneuropathy (amyloid, diabetes, etc.) | |
| | e. | Cranial | | |
| | | i. | Trigeminal | |
| | | ii. | Facial | |
| | | iii. | Spinal accessory | |
| | | iv. | Other cranial neuropathy | |
| | f. | Hyperexcitability states (Isaacs, other myokymias, fasciculation/cramp, etc.) | | |
| 2. | Central disease—motor neuron, cord, stem | | | |
| | a. | ALS/PLS | | |
| | b. | Inherited motor neuron diseases, adult (e.g., SMA, Kennedy) | | |
| | c. | Inherited motor neuron disease, pediatric (e.g., SMA, Hirayama, hexosaminidase deficiency) | | |
| | d. | Polio, West Nile virus, other infectious etiologies | | |
| | e. | Post-polio syndrome | | |
| | f. | Other (e.g., syrinx, AV fistula) | | |
| 3. | Neuromuscular junction disease | | | |
| | a. | Myasthenia gravis | | |
| | b. | LEMS | | |
| | c. | Botulism | | |

| | | | | |
|---|---|---|---|---|
| | | | d. | Other (congenital myasthenic syndromes; repetitive CMAPs with single stimuli, etc.) |
| | | 4. | Muscle disease | |
| | | | a. | Inflammatory |
| | | | b. | Dystrophy (pediatric) (e.g., Duchenne, Becker, congenital myotonic) |
| | | | c. | Dystrophy (adult) (e.g., myotonic, FSH, OPMD) |
| | | | d. | Metabolic/toxic (storage diseases, endocrine, mitochondrial, critical illness, steroid, etc.) |
| | | | e. | Channelopathies (periodic paralyses, myotonia/paramyotonia congenita, etc.) |
| | | | f. | Medications/toxin (e.g., steroid, chloroquine, statin) |
| | | 5. | Prognosis, evolution of disease | |
| | | | a. | NCS features |
| | | | b. | Needle EMG features |
| **03.** | **Other CNP** | | | |
| | A. | Sleep | | |
| | | 1. | Normal (stages and morphology of sleep) | |
| | | 2. | Apnea | |
| | | | a. | Obstructive |
| | | | b. | Central |
| | | | c. | Mixed |
| | | 3. | Narcolepsy | |
| | | 4. | Polysomnography | |
| | | 5. | Multiple sleep latency test | |
| | | 6. | Periodic limb movements | |
| | | 7. | Parasomnias | |
| | B. | Evoked potentials | | |
| | | 1. | Technical | |
| | | | a. | Signal averaging |
| | | | b. | Stimuli parameters |
| | | | c. | Other |
| | | 2. | SSEP lower | |
| | | | a. | Normal pattern (e.g., poor cervical response) |
| | | | b. | Peripheral neuropathy pattern |
| | | | c. | Myelopathy pattern |
| | | 3. | SSEP upper | |
| | | | a. | Brain death/coma prognosis |
| | | | b. | Focal lesion |

| | | | |
|---|---|---|---|
| | | 4. | BAEP |
| | | 5. | VEP |
| | | 6. | Other |
| | C. | Autonomic | |
| | | 1. | Tilt table testing |
| | | 2. | Valsalva testing |
| | | 3. | Heart rate variability |
| | | 4. | QSART/TST |
| | | 5. | Sympathetic pathways |
| | | 6. | Parasympathetic pathways |
| | | 7. | Cardiovagal |
| | | 8. | Other |
| | D. | Ethics | |
| | E. | Safety | |
| | | 1. | General electrical |
| | | 2. | EMG morbidity/complications |
| | | 3. | EEG/monitoring morbidity and complications |
| | | 4. | Electrode/neuroimaging safety |
| | F. | Central EMG, movement disorders | |
| | G. | Intraoperative monitoring and ICU | |
| | | 1. | NCS |
| | | 2. | EMG |
| | | 3. | EEG (CEA, TAA, other carotid endarterectomy) |
| | | 4. | EP (SSEP, PAEP, MEP) |
| | | 5. | Mapping |
| | | 6. | Anesthetic events |
| **04.** | **Basic Science** | | |
| | A. | Physiology | |
| | | 1. | Potentials—resting, action, conduction |
| | | 2. | Synaptic transmission—NMJ, central |
| | | 3. | Generators—anatomy, mechanisms |
| | | 4. | Temperature effects |
| | | 5. | Volume conduction—polarity, far-/near-field |
| | B. | Instrumentation | |