**PART I EXAMINATION**

The 2.5 hour examination will be administered at a Prometric Testing Center. The examination consists of 120 objective, multiple-choice questions (1 correct answer and 3 distractors).

A candidate who is unsuccessful on the Part I examination may repeat the test within two years without filing a new application by advising the Executive Director and submitting a second examination fee. If the candidate does not pass the examination within five years, a new application, application fee, and examination fee must be filed with the Board. Eligibility requirements will be those in place at the time of the new application.

**I.** **Physiology and Instrumentation** **30%**

 A. Physiology

 1. Anatomy of neural generation

 2. Mechanisms of EEG and evoked potential generation

 3. Pathophysiology of abnormal waveforms

 4. Basic mechanisms of epileptogenesis

 B. Instrumentation and Recording

 1. Basic electricity and electronics

 2. Amplifiers and their characteristics

 3. Calibration

 4. Filters

 5. Localization and polarity

 6. Artifacts

 7. Electrical safety

 8. Computers and principles of averaging

 9. Electrodes and their application

 10. Techniques of ECS determination

 11. Statistics

 12. Long term monitoring

1. Instrumentation and safety in the operating room
2. Principles of EEG digitalization

**II.** **Clinical EEG** **30%**

 A. Normal EEG

 1. Maturational changes (neonatal, etc.)

 2. Normal adult patterns-wake

 3. Normal sleep patterns

 a. Neonatal

 b. Child

 c. Adult

 4. Normal variants

 5. Activation procedures

 B. Abnormal EEG

 1. Neonatal disorders

 2. Epileptiform abnormalities

 3. Seizures

 a. Childhood

 b. Adulthood

 4. Spells

 5. Focal lesions of the CNS

 6. Encephalopathy

 7. Brain death and Electrocerebral Inactivity

 8. Drug and treatment effects

**III.** **EEG Recording Techniques** **10%**

 A. Ambulatory EEG monitoring

 B. Video/EEG monitoring

 C. Critical Care EEG

 1. Coma

 2. Periodic Patterns

 3. Non-clinical seizures

 d. Status Epilepticus

 D. EEG during surgery

 1. Indications and considerations

 2. Carotid endarterectomy

 3. Epilepsy

 E. Quantitative EEG

**IV.** **Clinical Evoked Potentials** **10%**

 A. Visual

 1. Criteria of abnormality

 2. Clinical correlation

 B. Auditory

 1. Criteria of abnormality

 2. Clinical correlation

 C. Somatosensory

 1. Criteria of abnormality

 2. Clinical correlation

 D. Event related

 1. Criteria of abnormality

 2. Clinical correlation

 E. Clinical Application in Demyelinating Disease

 F. Other monitoring

**V.** **Basic Principals of Intraoperative Monitoring** **10%**

 A. SEP monitoring of the spinal cord

 B. BAEP monitoring during brainstem surgery

 C. Motor evoked potential monitoring for spinal cord surgery

 D. Cranial nerve monitoring

 a. Acoustic Neuromas

 b. Facial nerve reconstruction

**VI.** **Clinical Sleep**  **10%**

1. Indications for PSG/MSLT
2. Scoring of sleep stages and arousals
3. Scoring of apneas and hypopneas
4. Scoring of periodic leg movements
5. Clinical significance of apnea-hypopnea index
6. Clinical significance in MSLT of mean sleep latency and sleep-onset REM

**PART II EXAMINATION**

The Part II two-hour examination will be administered at a Prometric Computer Testing location or remotely proctored by Prometric.

The examination consists of approximately 100-120 objective, multiple-choice questions (1 correct response and 3 distractors). Candidates will have two hours to complete the track selected.

The candidate must select at least one of four tracks for the completion of Part II. Tracks include Epilepsy Monitoring, Neurophysiologic Intraoperative Monitoring, Critical Care EEG and General Clinical Neurophysiology.

**Epilepsy Monitoring Track**

**Content Outline**

**I. Correlation of interictal EEG with seizure type 10%**

A. Partial onset

B. Secondarily generalized

C. Primary generalized

1. Convulsive

2. Nonconvulsive

**II. Identification of various patterns of ictal onset, propagation, and resolution along with their localizing significance in scalp recordings 25%**

A. Focal onset seizure

B. Generalized convulsive seizure

C. Generalized nonconvulsive seizure

D. Syndromes

 1. Hypsarrhythmia – electrodecremental seizures

 2. Lennox Gastaut syndrome

 3. Electrical SE during slow sleep

 4. Landau-Kleffner syndrome

E. Recognition of non-ictal events & patterns

 1. Artifacts

2. Nonepileptic paroxysmal patterns

F. Technical aspects

 1. Appropriate recording montages

 2. Use of additional electrodes (T1, T2, sphenoidals, etc.)

 3. Activation techniques

 4. Other approaches that may assist in event interpretation

**III.** **Recognition of clinical manifestations of various seizure types, and their appropriate classification 20%**

A. Simple partial

B. Complex partial

1. Automatisms

2. Lateralizing signs

3. Localizing signs

C. Secondarily generalized

1. Lateralizing signs

2. Localizing signs

D. Primary generalized

1. Convulsive

2. Absence

E. Myoclonic

F. Atonic

**IV.** **Identification and localization of neonatal seizures 6%**

A. Interictal EEG patterns

B. Ictal EEG patterns

 1. Focal

2. Multifocal

C. Clinical manifestations

**V.** **Recognition of behavioral features suggestive of non-epileptic events 15%**

A. Psychogenic

B. Syncope/Arrhythmia

C. Parasomnia

D. Other

**VI.** **Planning and Interpretation of Intracranial Monitoring 2%**

A. Indications for intracranial monitoring

B. Choice of intracranial electrodes

1. Subdural strips

2. Grids

3. Depth electrodes

4. Stereo EEG

C. Interictal epileptiform activity

D. Ictal activity

 1. Identification of seizure onset

2. Localization

E. Functional mapping with cortical stimulation

 1. Intra-operative

 2. Extra-operative

**VII.** **Evaluation of patients for epilepsy surgery 12%**

A. EEG findings leading to

1. Temporal lobectomy

2. Corpus callosotomy

3. Multiple subpial transection

4. Neurostimulators

5. Stereotactic ablation and other techniques

B. EEG and the intracarotid amobarbital test (Wada)

C. Intraoperative electrocorticography

1. Uses

2. Limitations

 D. Other diagnostic modalities

1. ictal SPECT

 2. MEG

3. EEG-fMRI

 4. PET-EEG

**Neurophysiologic Intraoperative Monitoring Track**

**Content Outline**

The NIOM Track will contain more complex multiple-choice questions focusd on all aspects of Neurophysiologic Monitoring. Candidates will have two hours to complete 100 items.

**I.** **Basic NIOM techniques – 20%**

**(Methodology and Principle/Neurophysiologic Anatomic Correlation)**

 A. SEP

 B. MEP

 C. BAEP

 D. EEG

 E. ECoG

 F. EMG/NCS

 G. VEP

 H. Others

**II.** **Planning an NIOM procedure – 5%**

 A. Customized multimodal technique for monitoring and mapping

 1. Extracting the necessary information from patient history and exam

 2. Choosing the appropriate techniques

 3. Foreseeing challenging recordings (poor baselines, changes with position)

 B. Discussing the plan with surgical/anesthesia teams

**III.** **Live NIOM monitoring and mapping – 40%**

 A. Critical steps of different surgical procedures

 B. Interpretation of monitoring results: expected patterns of neurophysiologic changes and

 mechanisms of injury

 C. Management of the neurophysiologic changes

 D. Interpretation of mapping results

 E. Communication in the operating room and documentation

**IV.** **Anesthetic effects on neurophysiologic recordings – 15%**

 A. SEP

 B. MEP

 C. BAEP

 D. EEG

 E. ECoG

 F. EMG/NCS

 G. VEP

 H. Anesthesia not modality related

 I. Others

**V.** **Operating room procedures – 15%**

 **(Equipment/networking issues and technical troubleshooting)**

A. NIOM equipment, hardware and software (e.g., amplifiers, filters, averaging, electrical issues)

 B. Other NIOM equipment (e.g., electrodes, stimulators, cables, connectors)

 C. Networking/Remote access

 D. Anesthesia and OR equipment, sterilization, safety in the operating room.

**VI. Ethical and medicolegal issues – 5%**

A. ACNS guidelines

 B. AANEM guidelines

 C. AAN guidelines

 D. Billing rules/CPT coding

E. Standard of care and other medicolegal issues

 F. Other

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**Critical Care EEG Monitoring**

**Content Outline**

**I. Terminology 15%**

A. Standardized critical care EEG nomenclature

B. Periodic discharges and modifiers

 C. Rhythmic delta activity and modifiers

 D. Clinical correlation

**II. Technical aspects of recording 5%**

 A. Electrodes

 B. Montages

 C. Troubleshooting

**III. Background patterns 15%**

A. EEG correlates of different types of encephalopathy

B. EEG continuity and reactivity

C. Medication effects

**IV. Artifacts 10%**

A. Physiological

B. Non-physiological

**V. Quantitative EEG 25%**

A. Basic principles of qEEG and trending

B. Clinical application

1. Identification of seizures

2. Identification of ischemia

3. Recognition of artifacts

**VI. Indications for long term ICU EEG monitoring 5%**

A. Seizures

B. Cerebrovascular disease

C. Coma and altered consciousness

**VII. Seizures and status epilepticus 15%**

A. Non-convulsive seizures

B. Status epilepticus

C. Ictal-interictal continuum

**VIII. Hypoxic-ischemic brain injury 10%**

A. Dynamic EEG changes

B. Prognosis

**General Clinical Neurophysiology**

**Content Outline**

**I. Electroencephalography 50%**

A. Physiology of normal and abnormal waveforms

B. Instrumentation and acquisition procedures (include quantitative EEG)

C. Normal patterns of various ages in wake, drowsy, and sleep states

D. Neonatal normal and abnormal patterns

E. Activating procedures (hyperventilation, photic stimulation)

F. Drug effects

G. Focal abnormalities

H. Diffuse abnormalities

I. Coma and brain death

J. Epileptiform abnormalities

K. Benign EEG variants and patterns of unknown significance

L. Artifacts

**II. Epilepsy Monitoring 25%**

A. Correlate interictal EEG with seizure type / epilepsy syndrome

1. Localization and propagation of epileptogenic foci (children, adults)
2. Correlation of behavioral and electrographic changes
3. Identify and localize neonatal seizures
4. Nonepileptic events (physiologic and psychogenic)
5. Plan and interpret intracranial monitoring

F. Evaluate patients for epilepsy surgery

**III. Evoked Potentials 5%**

1. Visual evoked potentials (pattern reversal)
2. Brain stem auditory evoked potentials
3. Short latency somatosensory evoked potentials

1. Stimulus and recording techniques

2. Criteria for identification of major waveform components

3. Criteria for normal and abnormal evoked potentials for adults and children

4. Presumed generator sources of major waveform components

5. Clinical significance of various evoked potential abnormalities

6. Technical and non-pathologic factors that influence evoked potentials and affect interpretation

**IV. Sleep 10%**

1. Recognition of sleep stages
2. Identification of examples showing the effects of age, physiological and environmental variables, and disease on sleep architecture
3. Interpretation of multiple sleep latency studies
4. Identification of polysomnographic findings in sleep-related disorders
5. Montages, special instrumentation and other technological aspects of sleep studies

**V. Intraoperative Monitoring 10%**

1. SEP monitoring for spinal cord, brainstem and cerebral surgery
2. BAEP monitoring techniques for eighth nerve and brainstem surgery
3. EEG monitoring for cerebral surgery
4. Motor evoked potential monitoring for spinal cord surgery
5. Cranial nerve monitoring
6. Criteria for decision making