

Neurological Electro-diagnosis
ACNB Subspecialty Examination Content Areas

Candidates for ACNB examination in the subspecialty of electrodiagnosis will be examined in the following knowledge areas.

Knowledge Areas:

Anatomy

Physiology

Specific conditions

NCV (Nerve conduction studies)

EMG (Electromyography)

EP's (SSEP, AEP, VEP studies)

The hands on practical portion

Anatomy:

There will be questions specific to anatomy, function and possible related pathologies of the following areas.

- Anatomy of the peripheral nerve.
- Anatomy of all nerve plexi
- Anatomy of each peripheral nerve, the muscles innervated by that nerve in order of innervation, the area of cutaneous reception of all nerves and the nerve roots that comprise that nerve.
- Anatomy of the spinal cord and related pathways.
- Anatomy of a muscle, muscle fascicle, and fiber.
- Anatomy of all nerve pathways including tunnels and areas of anatomy that could be related to injury or entrapment.
- Know the major and usable muscles related to neurological diagnostics. Know their location, innervation and how to activate each one.
- Understand the organization of the central nervous system and longitudinal levels of the lesion.
- Understand the visual pathway system.
- Understand the auditory pathway system.
- Understand central motor and sensory pathways.

Physiology:

EDX and Related physiology.

- Physiology related to action potentials, receptor potentials and conduction velocities.

- Calculations of conduction velocities.
- Physiology related to muscle contraction.
- Physiology related to muscle denervation.
- Synaptic related physiology and all information related to the neuromuscular junction, pathologies related to junctional disease prognosis.
- Information related to electricity and instrumentation. This includes aspects of circuitry and information related to electromagnetic properties.

Nerve conduction studies:

Understand all related information applicable to the following knowledge areas. All related testing technique, anatomy and areas of dysfunction. Interpretation of related studies. Normative and pathological scenarios.

- Understand all information related to all nerves and specifically:
 - Axillary motor
 - Musculocutaneous motor
 - Median motor and sensory (Sensory anti and orthodromic studies)
 - Median F waves
 - Ulnar motor and sensory (Sensory anti and orthodromic studies)
 - Ulnar F waves
 - Radial motor and sensory studies.
 - Medial and lateral antebrachial cutaneous studies.
 - Suprascapular studies
 - Peroneal motor and sensory studies
 - Peroneal F wave studies
 - Tibial motor and sensory studies
 - Tibial F wave studies and related H wave studies
 - Femoral motor studies
 - Saphenous sensory studies.
 - Sural sensory studies
 - Plantar sensory studies
- Understand information related to normative values for all studies.
- Understand information related to amplitude, latency and conduction velocity
- Understand temporal dispersion.
- Understand F and H wave physiology and axonal reflexes.
- Understand the physiology of the neuromuscular junction.
- Understand anodal block
- Understand all anomalies
 - Accessory peroneal anastomosis
 - Martin Gruber anastomosis

- Blink studies
- Repetitive stimulation studies
- Understand inching techniques.
- Common mode rejection
- Information related to patient size and age.
- Information related to body temperature
- Understand exercise tests

SSEP studies:

Understand all information related to this type of testing, including but not limited to technical setup, performance and related pathologies, related physiological mechanisms, normative and pathological conditions.

- SSEP studies to the tibial nerve
- SSEP studies to the peroneal nerve
- SSEP studies to the median nerve
- SSEP studies to the ulnar nerve
- Visual evoked studies, Including flash, pattern shift and full field
- BAER (AEP) Brainstem studies.

Electromyography:

Understand information related to the knowledge area for this type of testing including technical setup, performance and related pathologies, physiological mechanisms, normative data and pathological conditions.

Understand information related to the following knowledge areas, including physiology and developmental mechanisms. Understand the characteristics of the following knowledge areas. Understand the knowledge areas related to the differential diagnosis and interpretation of possible clinical scenarios. Be able to identify the following pathologies on video and/or printed recording.

- insertion activity
- end plate spikes
- end plate noise
- cramp discharge
- fibrillations
- positive sharp waves
- fasciculations

- complex repetitive discharge
- myotonia
- myokymia
- neuromyotonia
- polyphasic potentials
- parasite potentials
- serration
- complex motor units and unstable motor units.
- doublets, triplets and multiplets
- recruitment
- activation
- jitter

Understand the following knowledge areas:

- EMG technique.
- Muscles tested.
- Information related to needles, sharps and sterile technique.
- Active and acute denervation verses chronic.

Specific conditions: Understand the information related to the following knowledge areas. Differential diagnosis, related special studies, patterns and electro-diagnostic findings.

- Understand the differences and diagnostic criterion between acute, subacute, chronic and long term conditions.
- Understand axonal lesions.
- Understand myelin pathology
 - Chronic and acute myelin illness.
 - Antibody related conditions
 - Inherited myelin lesions and specific information related to genetic deletion or duplication.
- Understand all muscle diseases and associated knowledge areas.
 - All congenital dystrophies.
 - Congenital muscular dystrophies
 - Disorders of muscle membranes
 - Myotonic dystrophy
 - Hypokalemic periodic paralysis
 - Isaac's disease
 - Myopathies in systemic and iatrogenic disease
 - Endocrine related myopathies
 - Toxic and drug induced myopathies

- Myopathies related to infection and exercise
 - Mitochondrial myopathies
 - Basic understanding of genetic pathology related to mitochondrial dysfunction
 - Inflammatory myopathies
 - Idiopathic inflammatory myopathy
 - Inclusion body myositis
 - Polymyositis
 - Dermatomyositis
 - Myotonic disorders
 - Myotonic dystrophies and congenita
- Understand ventral horn cell disease
 - Werdnig-Hoffman Disease
 - Kugelberg-Welander Syndrome
 - ALS
 - Progressive muscular atrophy
 - Progressive bulbar palsy
- Understand peripheral nerve disease
 - Radicular injuries
 - Plexus injuries
 - Peripheral nerve disease
 - Asymmetric verses symmetric
 - Temporal course/Natural History
 - Axonal
 - Myelin
 - AIDP
 - CIDP
 - Diabetic / thyroid related neuropathy
 - Progression (Proximal verses distal verses global characteristics)
 - Inherited conditions. All CMT pathologies, peroneal muscular atrophies.
 - Related to vasculitis
 - Uremic conditions
 - Autoimmune related (MAG, GM1, GALLOP, Sulfatide)
 - Infection
 - Paraneoplastic
 - Infections / toxic (Included drug induced)
 - Nutritional (B vitamin and lack of nutrition, ex: alcohol)
 - Related to arthritic and inflammatory conditions
 - Understand the differentials and related conditions to each of the following:
 - Small fiber pathologies

- Myelin only pathologies
- Mainly motor fibers
- Mainly large sensory fibers.
- Axon pathologies
- Understand metabolic and systemic conditions
 - Diabetes and thyroid conditions
- Understand neuromuscular junction illnesses
 - Myasthenia Gravis
 - Lambert Eaton
 - Botulism
- Understand inherited diseases
 - All CMT pathologies
- Understand related spinal cord conditions
 - Syrinx
 - Anterior spinal artery
 - Hemisection
 - Extrinsic cord pathologies
 - Intrinsic cord pathologies
 - Characteristic related to myelopathy
- Understand related vascular pathologies and conditions
 - Peripheral vascular disease
 - Basilar circulation
 - Main cerebral circulation
- Understand related brainstem, cerebellar and cortical pathologies

Related Laboratory Studies:

- Understand basic blood chemistry and metabolic panel and how its relationship to peripheral nerve disease. An example would be hemoglobin A1C and diabetes.
- Understand genetic markers. An example would be PMP22 deletion or duplication testing for CMT pathologies.
- Nutritional evaluations. An example would be B vitamin analysis
- Understand vascular studies and inflammatory markers
- Understand studies related to ultrasound and sonography. An example would be carotid ultrasound and pathologies that can be measured on AEP and VEP testing due to stroke of vascular lesion.
- Basic MRI information. An example would be disc lesions, certain levels that they may be at and what nerve root might be affected.

The practical examination:

- The practical will have a very specific didactic component. The participant will be required to perform an NCV and an EMG test. This will include one nerve and one muscle. The participant will not know which nerve or which muscle before the examination and must be prepared and competent to examine all areas of the nervous system. The participant will be graded on location, technique and troubleshooting. The participant will not be tested on the knowledge of operation of a diagnostic machine due to differences between manufacturers. If there is a technical problem with the operation of diagnostic machinery, including software or hardware problems, the proctor will assist and the participant will not be penalized.
- During the NCV the participant will be graded on the following:
 - Set up
 - Stimulation site
 - Electrode positioning
 - Stimulation points.
 - Reliable waveforms without artifact
 - Calculating conduction velocity
 - Must answer questions related to the nerve being tested
- During the EMG the participant will be graded on the following:
 - Sterile technique
 - Inserting into the right nerve and activating the muscle being tested appropriately.
 - Must demonstrate an assessment of insertion activity.
 - Must assessment spontaneous activity.
 - Must do a motor unit analysis.
 - Must assess recruitment
 - Must assess activation
 - Must do an acceptable amount of samples per muscle tested.
 - Must answer questions related to each muscle tested.
- There will a section on video analysis
 - There will be a video of a pathological waveforms on EMG testing. These must be identified correctly.
 - There will be questions asked related to the identified waveform.
- There will be a section on differential diagnosis
 - The participant's knowledge of differential diagnosis will be challenged during this section. An example would be the difference in regards to subjective complaints, objective findings, EMG, NCV and SSEP findings between cervical myelopathy and ALS. There will be detailed questions and analysis between a variety of conditions. The participant will be tested in this section on their comprehensive knowledge of the material and the nervous system. The strengths and weaknesses of the practitioner will be assisted during this section.