

# NeuroTrace Study Guide

**Domain:** Domain II – Performing the EEG Study

**Section:** Waveform Identification & Pattern Recognition

**Style:** Pattern-focused, recognition-based, exam-oriented

---

## 1. Core Principles (Must Know)

### Waveform Identification Is Foundational

- **Waveform identification is foundational for EEG interpretation**
- Technologists must recognize normal vs abnormal patterns
- Pattern recognition guides further analysis
- Accurate identification is essential

### Normal Patterns Must Be Recognized

- **Normal patterns must be recognized to avoid misinterpretation**
- Many normal variants can mimic abnormal patterns
- Understanding normal patterns is critical
- Age-related differences are important

### Key Principle

- **Accurate pattern recognition guides interpretation and clinical correlation**
- Learn characteristic features of each pattern
- Understand normal vs abnormal

### Practical Application

- Learn to identify common waveforms
  - Understand normal variants
  - Recognize abnormal patterns
  - Document observations accurately
- 

## 2. Normal Background Rhythms

### Posterior Dominant Rhythm (PDR/Alpha)

- **Frequency:** 8-13 Hz (adults)
- **Location:** Posterior (occipital) regions
- **State:** Wakefulness, eyes closed
- **Characteristics:** Sinusoidal, symmetric, reactive to eye opening
- **Age:** Slower in children, may be slower in elderly

### Beta Activity

- **Frequency:** 20-30 Hz
- **Location:** Frontally predominant
- **Characteristics:** Low amplitude, may increase with medications (benzodiazepines, barbiturates)
- **Normal:** Present in wakefulness

### Theta Activity

- **Frequency:** 4-7 Hz

- **Location:** Temporal regions (adults), more prominent in children
- **Characteristics:** Low amplitude in adults, normal in children
- **Normal:** May be present in temporal regions

### Delta Activity

- **Frequency:** 1-3 Hz
- **Location:** Absent or minimal in normal awake adults
- **Characteristics:** High amplitude if present (abnormal in awake adults)
- **Normal:** Present in sleep, absent in wakefulness

### Key Rule

- **Normal background varies with age and state**
  - Understand age-related norms
  - Recognize reactivity (PDR attenuates with eye opening)
- 

## 3. Normal Sleep Patterns

### Sleep Spindles

- **Frequency:** 11-15 Hz
- **Location:** Central regions (C3, C4, Cz)
- **State:** N2 sleep (stage 2)
- **Characteristics:** Rhythmic, brief bursts, symmetric
- **Age:** More prominent in children

### K-Complexes

- **Characteristics:** High-amplitude, sharp negative wave followed by positive wave
- **Location:** Central regions
- **State:** N2 sleep
- **Function:** Response to stimuli, sleep maintenance

### Vertex Waves

- **Characteristics:** Sharp, high-amplitude waves
- **Location:** Cz (vertex), maximal
- **State:** Light sleep (N1/N2)
- **Appearance:** Sharp, may be high amplitude

### POSTS (Positive Occipital Sharp Transients)

- **Characteristics:** Positive sharp waves
- **Location:** Occipital regions
- **State:** Sleep
- **Normal:** Benign sleep graphoelement

### Key Rule

- **Normal sleep patterns are age-specific**
  - Learn sleep stage characteristics
  - Recognize normal sleep graphoelements
- 

## 4. Normal Variants

## Mu Rhythm

- **Frequency:** 8-13 Hz (alpha range)
- **Location:** Central regions (C3, C4)
- **Characteristics:** Arch-shaped, attenuates with contralateral limb movement
- **Normal:** Benign variant, not epileptiform

## Lambda Waves

- **Characteristics:** Positive sharp waves
- **Location:** Occipital regions
- **State:** Wakefulness, with eye movement/scanning
- **Normal:** Benign variant

## Wicket Spikes

- **Frequency:** 6-11 Hz
- **Location:** Temporal regions
- **State:** Drowsiness/sleep
- **Characteristics:** Arciform, do not disrupt background
- **Normal:** Benign variant, not epileptiform

## Key Rule

- **Normal variants must not be misinterpreted as abnormal**
  - Learn distinguishing features
  - Understand when variants are normal
- 

# 5. Abnormal Patterns (Recognition Level)

## Epileptiform Discharges

- **Spikes:** <70 ms duration, sharp
- **Sharp waves:** 70-200 ms duration
- **Spike-and-wave:** Spike followed by slow wave
- **Location:** Focal or generalized

## Focal Slowing

- **Polymorphic delta:** Irregular, focal
- **Indicates:** Structural lesion, dysfunction
- **Location:** Focal region

## Diffuse Slowing

- **Theta/delta:** Widespread, reduced background organization
- **Indicates:** Encephalopathy, dysfunction
- **Severity:** Mild, moderate, severe

## Key Rule

- **Technologists identify patterns, not diagnoses**
  - Describe patterns objectively
  - Document observations accurately
- 

# 6. Age-Related Patterns

## Neonatal Patterns

- **Trace alternant:** Alternating activity and quiescence (quiet sleep)
- **Discontinuous:** Periods of activity and quiescence (premature)
- **Active sleep vs quiet sleep:** Different from adult stages

## Pediatric Patterns

- **Slower PDR:** Age-dependent frequency
- **More prominent sleep spindles:** Longer duration
- **More theta:** Normal in temporal regions

## Key Rule

- **Normal patterns vary with age**
  - Understand age-specific norms
  - Adapt expectations for age
- 

## 7. Exam Readiness Checklist

Use this checklist to verify your understanding:

- ☐ Can identify PDR (alpha) and its characteristics
  - ☐ Can identify beta, theta, delta activity
  - ☐ Understand normal sleep patterns (spindles, K-complexes, vertex waves)
  - ☐ Can identify normal variants (mu, lambda, wicket)
  - ☐ Can recognize epileptiform discharges (recognition level)
  - ☐ Can identify focal and diffuse slowing
  - ☐ Understand age-related differences
  - ☐ Know reactivity (PDR attenuates with eye opening)
  - ☐ Can distinguish normal vs abnormal patterns
- 

## 8. Internal Cross-Links

### Workflow

- **Normal EEG Rhythms:** Detailed rhythm information
- **Sleep & Graphoelements:** Detailed sleep patterns
- **Normal Variants:** Detailed variant information

### Patterns

- **Pattern Library:** Detailed pattern information
- **Epileptiform Discharges:** Detailed discharge information

### Quizzes

- **Waveform identification MCQs:** Questions on pattern recognition
  - **Normal vs abnormal questions:** Questions on differentiation
- 

## Study Tips

1. **Memorize pattern characteristics:** Frequency, location, state, appearance

2. **Learn normal variants:** Mu, lambda, wicket - not epileptiform
  3. **Understand age differences:** Children vs adults
  4. **Know sleep patterns:** Spindles, K-complexes, vertex waves
  5. **Practice recognition:** Visual identification is key
  6. **Understand reactivity:** PDR attenuates with eye opening
  7. **ABRET focus:** Expect questions on pattern identification, normal vs abnormal, age-related differences, and reactivity
- 

### **End of Study Guide**

*For additional practice, complete quiz questions tagged: waveform-identification, pdr, sleep-patterns, normal-variants, pattern-recognition*