



TeachEngineering

What is a Brain Wave?



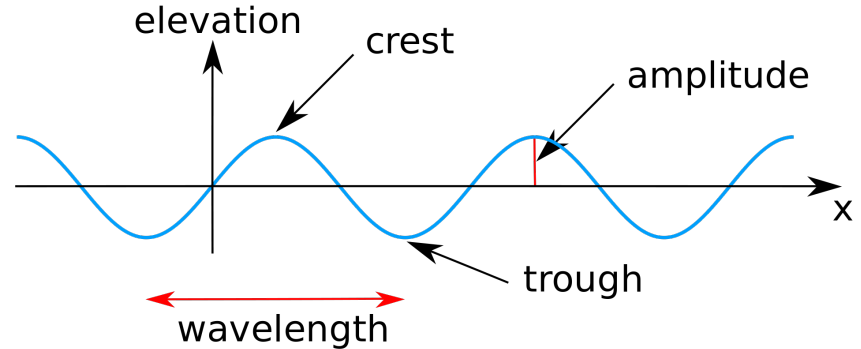
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Wave Review

- **Waves carry energy through space**
 - **Examples of waves:**
 - Ocean waves
 - Sound waves
 - Light waves
- **Waves may be characterized by their frequencies**
 - How many full waves occur per second

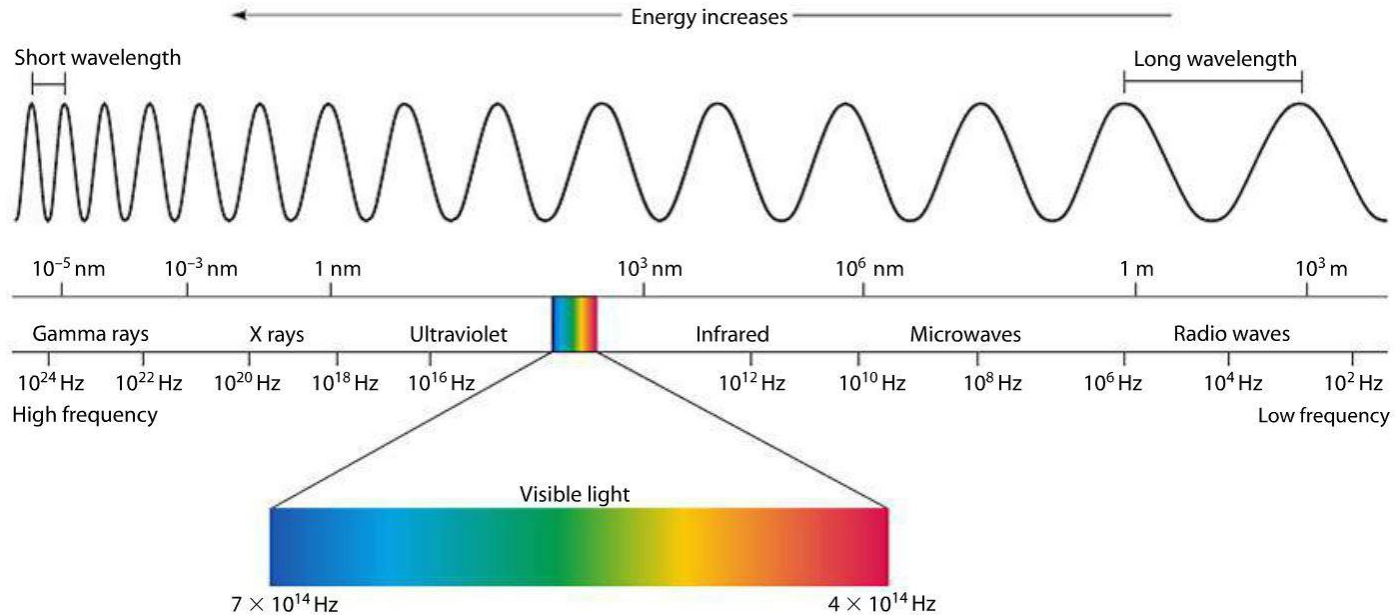


https://upload.wikimedia.org/wikipedia/commons/thumb/8/84/Sine_wave_amplitude.svg/2000px-Sine_wave_amplitude.svg.png

More on Frequency

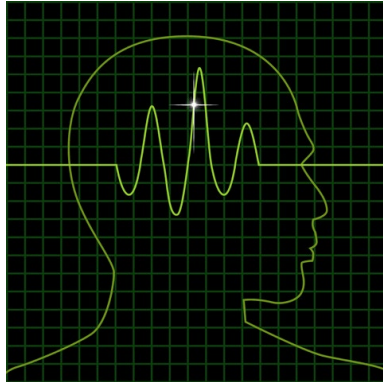
- **Higher frequencies result in more energy being transferred over time**
- **Lower frequencies result in less energy being transferred over time**
- **Example: electromagnetic (EM) waves**
 - **EM waves with higher frequencies (UV, x-ray, gamma) carry more energy, and can harm us if we are exposed to them for long periods of time**
 - **EM waves with lower frequencies (radio, infrared, light) carry less energy, and are safe for human contact**

Example: Electromagnetic Spectrum



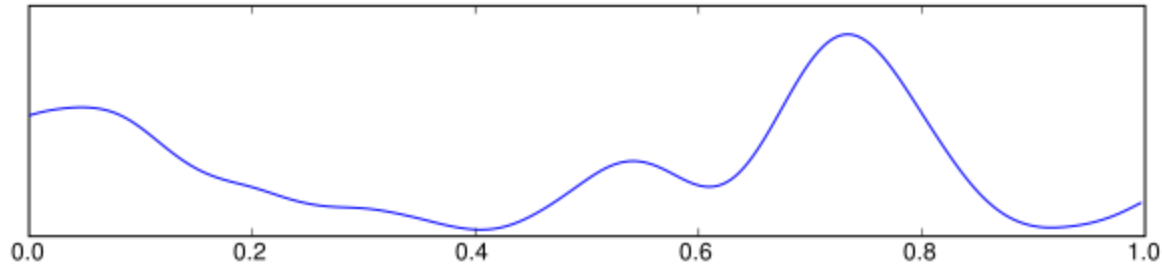
How do our brains use energy?

- Our nervous system also uses waves to transfer energy throughout the body
 - We call these brain waves
- Brain waves are classified by their frequencies, and each type is associated with a different level of human behavior



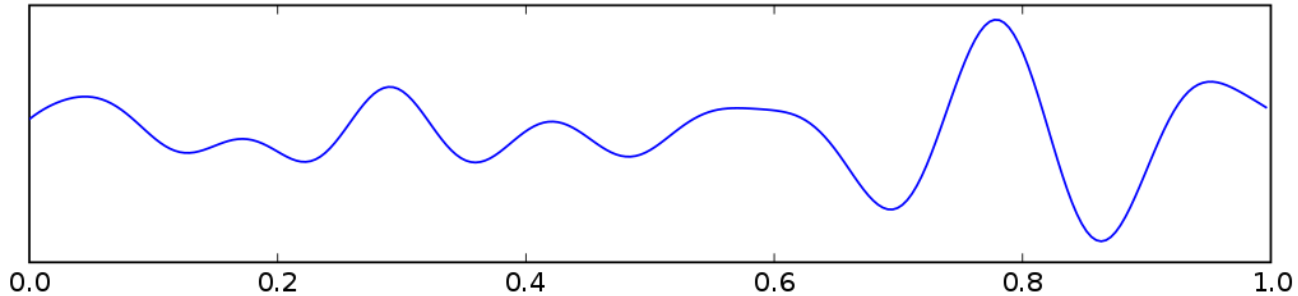
Types of Brain Waves: Delta

- Delta waves are brain waves with frequencies between ~ 0.2 Hz – 3 Hz
- These waves are associated with a deep, restful state
 - Example of associated behavior: deep sleep



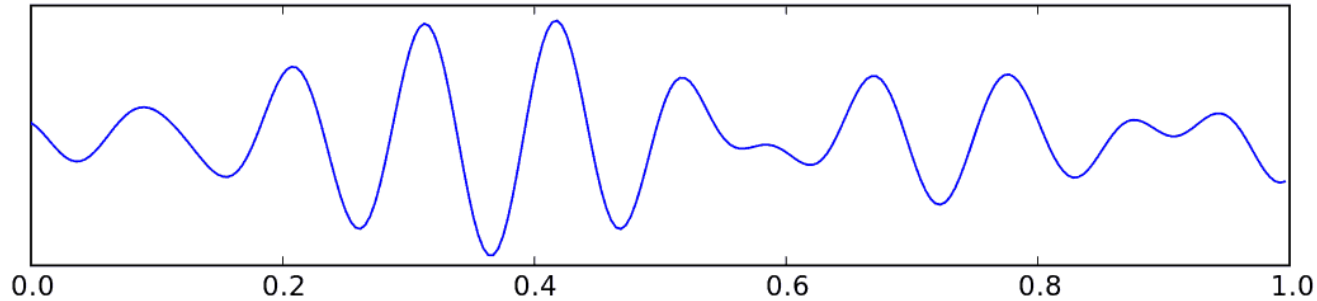
Types of Brain Waves: Theta

- Theta waves are brain waves with frequencies between ~4 Hz – 8 Hz
- These waves are associated with a deeply relaxed, meditative state
 - Examples of associated behavior: napping/light sleep, deep meditation



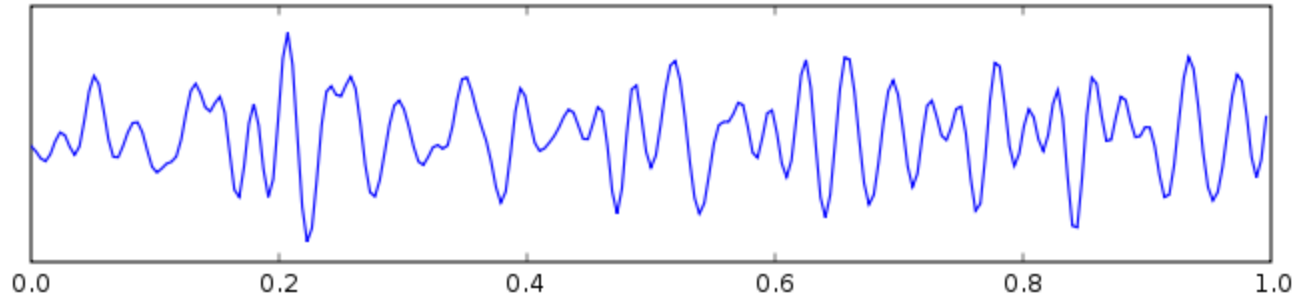
Types of Brain Waves: Alpha

- Alpha waves are brain waves with frequencies between ~9 Hz – 13 Hz
- These waves are associated with a calm, lucid state
 - Examples of associated behaviors: light meditation, daze/daydreaming



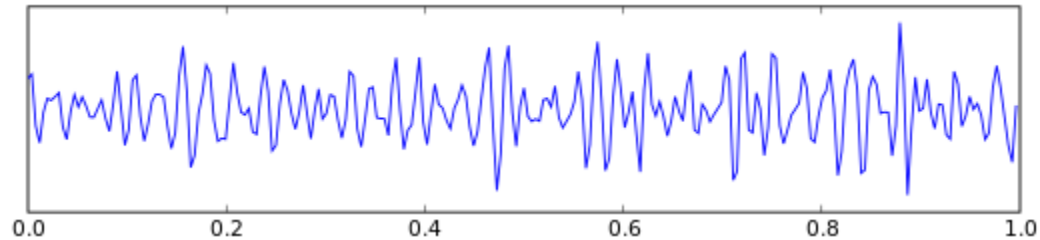
Types of Brain Waves: Beta

- Beta waves are brain waves with frequencies between ~14 Hz – 30 Hz
- These waves are associated with a normal, awake state
 - Examples of associated behaviors: working, actively listening, reading



Types of Brain Waves: Gamma

- Gamma waves are brain waves with frequencies greater than 30 Hz
- These waves are associated with a concentrated state
 - Examples of associated behaviors: intense focus, working on a difficult problem



Brain Wave Overview

