What Are Electromagnetic Waves?

How are electromagnetic waves different from mechanical waves?

What Are Electromagnetic Waves?

Electromagnetic waves –

- Electromagnetic waves differ from mechanical waves –

DOK Question:

Construct a visual model of this difference.

What Are Electromagnetic Waves?

How They Travel

Changing electric fields produce changing magnetic fields, and changing magnetic fields produce changing electric fields-

Electromagnetic waves-

- The transfer of energy by electromagnetic waves traveling through matter or across space is -

The Speed of Electromagnetic Waves

What is the maximum speed of light?

Wavelength and Frequency

How do electromagnetic waves differ from one another?

Wavelength and Frequency

Math Practice

1. A global positioning satellite transmits a radio wave with a wavelength of 19 cm. What is the frequency of the radio wave? (*Hint:* Convert the wavelength to meters before calculating the frequency.)

Wavelength and Frequency

Math Practice

2. The radio waves of a particular AM radio station vibrate 680,000 times per second. What is the wavelength of the wave?

Wavelength and Frequency

Math Practice

3. Radio waves that vibrate 160,000,000 times per second are used on some train lines for communications. If radio waves that vibrate half as many times per second were used instead, how would the wavelength change?

Wave or Particle?

What is the dual nature of electromagnetic radiation?

Wave or Particle?

Scientists know -

- It is –

DOK Question:

Construct a visual model of this difference.

Wave or Particle?

The emission of electrons from a metal caused by light striking the metal is -

In 1905, Albert Einstein (1879–1955) proposed that light, and all electromagnetic radiation, consists of packets of energy.

These packets of electromagnetic energy are –

DOK Question

Hypothesize who was Einstein.

Intensity

What happens as light travels farther from its source?

Intensity

Intensity is-

- As waves travel away from the source -
- The total energy does not change -

Assessment Questions

1. How are electromagnetic waves different from all mechanical waves?
   a. Electromagnetic waves don't carry energy.
   b. Electromagnetic waves are invisible.
   c. Electromagnetic waves are longitudinal waves.
   d. Electromagnetic waves can travel through a vacuum.

Assessment Questions

2. What is the wavelength of a radio wave that has a frequency of 1.5×10^6 Hz? ($c = 3.0 \times 10^8$ m/s)
   a. 45 m
   b. 200 m
   c. 450 m
   d. 2 km

Assessment Questions

3. The photoelectric effect is evidence that light behaves like
   a. a wave.
   b. a particle.
   c. both a wave and a particle.
   d. neither a wave nor a particle.

Assessment Questions

1. As photons travel farther from a light source, the intensity of light stays the same.

   True
   False