Electromagnetic Waves

As a refresher, define the following terms:

Wavelength:

Frequency:

Amplitude:

Transverse wave:

Longitudinal wave:

Draw a transverse wave. Include at least 3 wave crests and 3 wave troughs. Identify the wavelength and the amplitude.

Use google to find the frequency and the wavelength of the following types of waves:

|  |  |  |
| --- | --- | --- |
| Wave Type | Frequency in Hz | Wave length in meters |
| Radio |  |  |
| Microwave |  |  |
| Infrared |  |  |
| Visible Light |  |  |
| Ultra Violet |  |  |
| Xray |  |  |
| Gamma Ray |  |  |

Speed, Frequency, and wavelength of a wave can be calculated using the following equation:

V = λ f where V = Speed of the wave, f = frequency of the wave, and λ is the wavelength.

Solve the following problems using the equations:

1. An ocean wave travels at approximately 1.97 m/s. This is 4 miles per hour. The frequency of the waves is roughly 0.07 hz (or roughly 4 waves per minute). What is the Wavelength?
2. Red visible light has a wavelength of 680 nanometers (6.8 x10-7 m). The speed of light is 3.0 x108 m/s. What is the frequency of red visible light?

PhET Radio Waves:

Do a google search for PhET Radio and Electromagnetic Waves.

When opening the file, you need to select download, then open the file.

1. Before playing with the sim, discuss what you think will happen when you move the transmitter electron.

2. Remember from when we learned about electricity, when electrons move, they create a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ field. Set the field display type to full field and the transmitter movement to oscillate. Describe what is happening

3. Change the frequency and amplitude sliders and describe what happens to the fields.

4. Set the transmitter movement to oscillate, field display type to curve with vectors, and radiated fields. Describe what is happening in the transmitter and the receiver.

5. Click on Electron Positions to activate the wave graphs. Describe what is happening in the transmitter and the receiver.

6. After playing around with the settings of frequency and amplitude, explain why you lose your FM radio signal as you travel farther away from the radio station’s transmitter.

7. Using the formula at the beginning of this lesson, calculate the wavelength of a signal from KPhET 98.7. Remember that FM stations transmit in the Megahertz range. This means that KPhET is transmitting a frequency of 9.87 x107 hz. What is the wavelength of the signal from this radio station?

8. My favorite radio station is NPR, which transmits a signal that is has a wavelength of 3.38 m. What is the frequency of this signal? Remember, light speed is 3 x108 m/s.

9. AM 630 is where I listen to sports. The frequency is 630 khz (or 630,000 hz). What is the wavelength?

10. Pick your favorite radio station, or one your friends listen to. What is its frequency and wavelength?