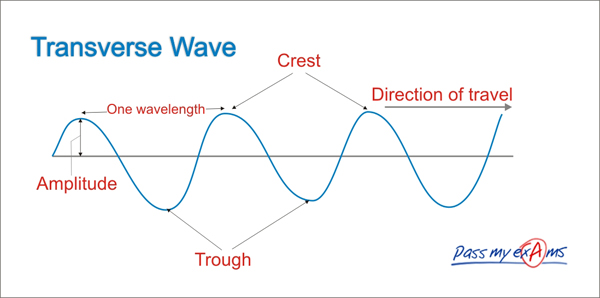
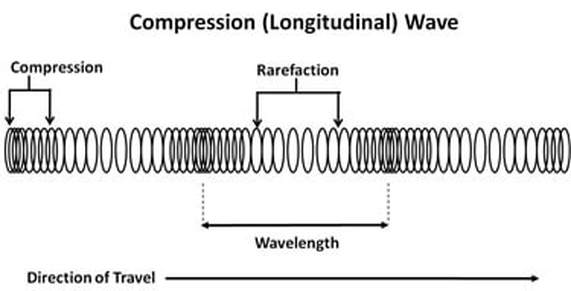
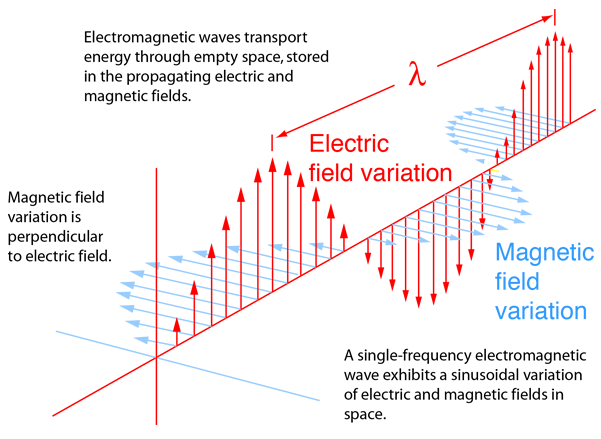
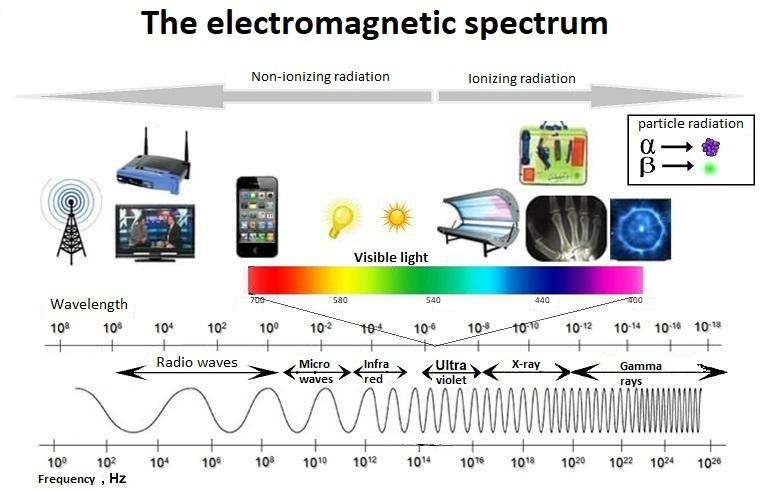
HPS Waves Class Notes 2020 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Objectives: Outline the properties of waves (i.e. velocity, wavelength, frequency, period, and amplitude) and describe their relationship (Obj 1); Describe the composition and production of electromagnetic waves (Obj 2); Compare and contrast regions of the electromagnetic spectrum based on frequency, wavelength, and energy (Obj 4).

Wave: repeating disturbance or movement (vibration) that transfers energy through matter and space.

1. Mechanical Wave: requires a medium (material through which a wave travels)  
   EX: water, sound, slinky, rope, table cloth
   1. Transverse Wave: matter moves perpendicular to the energy/direction of the wave   
      EX: light
      1. Crest: highest point on the wave
      2. Trough: lowest point on the wave
      3. Wavelength: distance from one spot on a wave to the same spot on the next wave
      4. Amplitude: height of wave from resting position to crest or trough (measure of the E in a wave)  
           
           
           
           
           
           
           
           
           
           
         
   2. Compressional Wave: matter moves parallel to the energy/direction of the wave  
      EX: sound
      1. Compression: medium spaced close together
      2. Rarefaction: medium spread out
      3. Wavelength: distance from one spot on a wave to the same spot on the next wave (same as transverse wave)
      4. Amplitude: related to how squished/spread out the compressions/rarefactions are  
           
           
           
           
           
           
           
           
           
           
           
           
         
2. Electromagnetic Wave: transverse wave consisting of changing electric fields and changing magnetic fields (may or may not travel through a medium) and traveling at ***c* (3.00x108 m/s)**  
   EX: light (all parts of EM spectrum)
   1. EM Wave Composition
      1. Electric Field - a region in space that exerts electric forces on charged particles  
         → produced by electric charges or changing magnetic fields
      2. Magnetic Field - a region of space that exerts magnetic forces  
         → produced by magnets, changing electric fields, or moving charges
   2. EM Wave Production
      1. EM waves are produced by constantly changing fields caused when an electric charge vibrates or accelerates
      2. Fields are perpendicular to each other
      3. Changing electric fields produce changing magnetic fields AND changing magnetic fields produce changing electric fields. (they regenerate each other!)
   3. EM Spectrum
      1. Full range of frequencies of EM radiation  
         
      2. Long wavelength, low frequency, low E Radio waves
      3. Short wavelength, high frequency, high E Gamma rays
3. Calculations
   1. Frequency (*f*) = the number of cycles per second  
      # cycles/second, f = 1/T, measured in **Hz, 1/s, s-1**
   2. Period (T) = time it takes for 1 cycle to pass through a point  
      seconds/# cycles, T = 1/f, measured in **s**
   3. Wavelength (λ) = 1 point on a wave to the same point on the next wave  
      λ = *v/ f,* measured in **m**
   4. Wave speed (*v*) = *f* x λ measured in **m/s**
   5. Sample 1: A drum is struck, producing a wave with a wavelength of 120cm and a speed of 2.24x104 m/s. What is the frequency? Period?
   6. Sample 2: A certain FM radio station broadcasts EM waves at a frequency of 8.89x107 Hz. What is the wavelength? *c* = *f* x λ where ***c* = (3.00x108 m/s)**