# Frequency/Wavelength/Energy

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Equations: Speed = frequency x wavelength Frequency = Speed / Wavelength Wavelength = Speed / Frequency

Units: Speed: m/s Frequency: Hz (1/s) Wavelength: meters

Speed of Light [and all Electromagnetic Spectrum Waves] (c) = 3.0 x 108 m/s

Energy = h . frequency h (Planck’s Constant) = 6.626 x 10-34 J . s

Units: Energy: Joules frequency: Hz (1/s)

**Problems:**

1. Violet light has a wavelength of 4.10 x 10-12 m. What is the frequency?

2. Green light has a frequency of 6.01 x 1014 Hz. What is the wavelength?

3. What is the wavelength (in meters) of the electromagnetic carrier wave transmitted by **The Sports Fan** radio station

at a frequency of 640 kHz? (Hint: convert kHz into Hz by multiplying by 103.)

4. Calculate the wavelength of radiation with a frequency of 8.0 x 1014 Hz.

5. What is the wavelength of light with a frequency of 7.66 x 1014 Hz?

6. A helium laser emits light with a wavelength of 633 nm. What is the frequency of the light?

[Hint: First, convert nanometers(nm) into meters by multiplying by 109]

7. What is the wavelength of X-rays having a frequency of 4.80 x 1017 Hz?

8. An FM radio station broadcasts at a frequency of 107.9 MHz. What is the wavelength of the radio signal?

[Hint: First, convert Mega Hertz (MHz) into Hertz by multiplying by 106]

9. If the limits of human hearing are 20 Hz. to 20,000 Hz, what are the sound wavelengths that are associated with these

two extremes, assuming the speed of sound is 345 m/s.

10. If a sound is produced at the orchestra standard frequency of 440 Hz. If the speed of sound is

345 m/s, what is the wavelength of the sound that is produced?

11. Calculate the energy of a photon of radiation with a frequency of 8.5 x 1014 Hz.

12. Calculate the energy of a photon of radiation with a wavelength of 6.4 x 10-7 m.

13. What is the energy of light whose wavelength is 4.06 x 10-11 m? (Hint: first find the Frequency)

14. Calculate the energy of a gamma ray photon whose frequency is 5.02 x 1020 Hz?

15. What is the relationship between frequency and wavelength? (Direct or Inverse)

16. Which part of the electromagnetic spectrum has the highest energy associated with it?

17. What kind of electromagnetic radiation has the longest wavelength?

18. What kind of electromagnetic radiation could be used to "see" molecules? A cold virus?

19. Why can't you use visible light to "see" molecules?

20. Some insects, like bees, can see light of shorter wavelengths than humans can see. What kind of radiation do you think a bee sees?