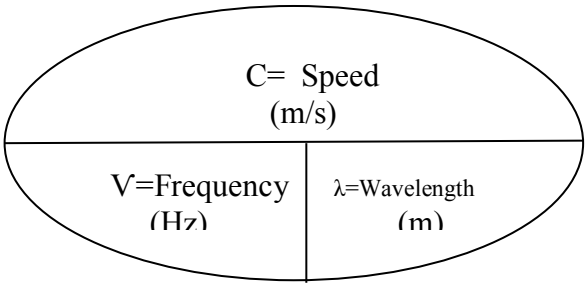
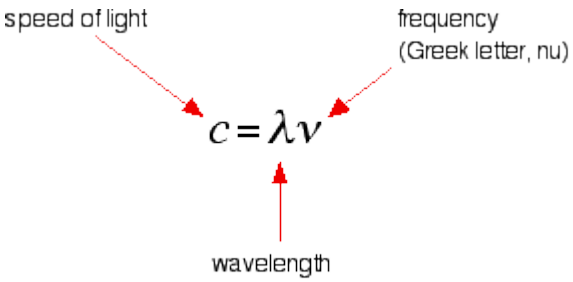
Name:

# Speed /Frequency / Wavelength

**Equation: Speed of all Electromagnetic Spectrum Waves**

**C=Speed (m/s) = Frequency (Hz) x Wavelength (m) or C = νλ**




Remember = **(c) = 3.0 x $10^8$ m/s; every time you will plug that constant in for speed of light!**

## Let's do #1 as an example

**1. Violet light has a wavelength of 4.10 x $10^{-12}$ m. <u>What is the frequency</u>?**
**Given:**
**Wavelength λ = 4.10 x $10^{-12}$ m**
**Speed of light c = 3.0 x $10^8$ m/s**
**Unknown= frequency**

**V** = $\frac{c}{\lambda}$ ***double check units on wavelength and speed of light to make sure they are both "meters"**

**V**= $\frac{3.00\ x\ 10^{8} m/s}{4.10\ x\ 10^{-12} m}$

**V=7.31 x $10^{19}$Hz**

**2. Green light has a frequency of 6.01 x $10^{14}$ Hz. What is the wavelength?**

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**3. What is the wavelength (in meters) of the electromagnetic carrier wave transmitted by <u>The Sports Fan</u> radio station at a frequency of 640 kHz?(Hint: convert kHz into Hz by multiplying by $10^3$.)**

**4. Calculate the wavelength of radiation with a frequency of $8.0 \times 10^{14}$ Hz.**

**5. What is the wavelength of light with a frequency of $7.66 \times 10^{14}$ Hz?**

**6. A helium laser emits light with a wavelength of 633 nm. What is the frequency of the light? (Hint: convert 633nm to m by dividing by $10^9$)**

**7. What is the wavelength of X-rays having a frequency of $4.80 \times 10^{17}$ 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 $10^6$)**

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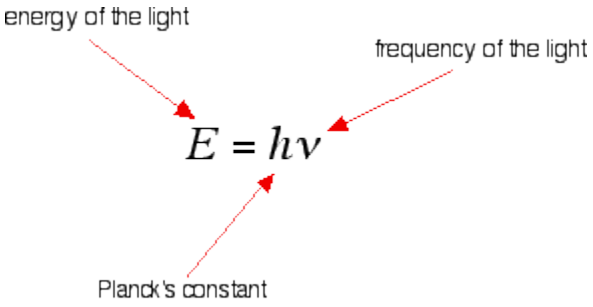
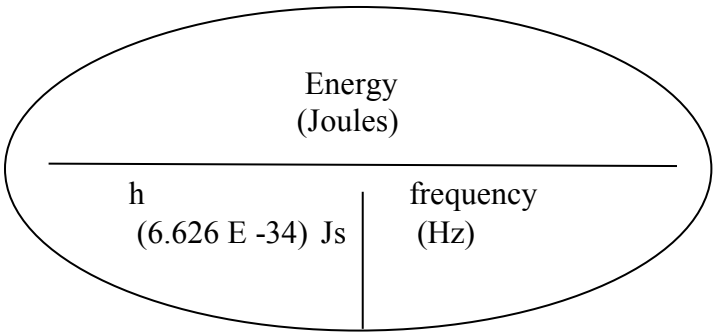
# Energy / Frequency / Wavelength

**Energy (J) = h $^{x}$ Frequency (Hz)** **h (Planck's Constant) = 6.626 x $10^{-34}$ J · s**




**Let's do #9 as an example**

**9. Calculate the energy of a photon of radiation with a <u>frequency of 8.5 x $10^{14}$ Hz.</u>**
**Given**
**Frequency = 8.5 x $10^{14}$ Hz**
**h (Planck's Constant) = 6.626 x $10^{-34}$ J · s**
**Unknown= energy**
**E=hv**
**Let's plug and chug! E= (6.626 x $10^{-34}$ J · s)( 8.5 x $10^{14}$ Hz)= 5.6x$10^{-19}$joules**

**10. Calculate the energy of a gamma ray photon whose frequency is 5.02 x $10^{20}$ Hz?**

**11. Calculate the energy of a photon of radiation with a wavelength of 6.4 x $10^{-7}$ m.**

**12. What is the energy of light whose wavelength is 4.06 x $10^{-11}$ m?**

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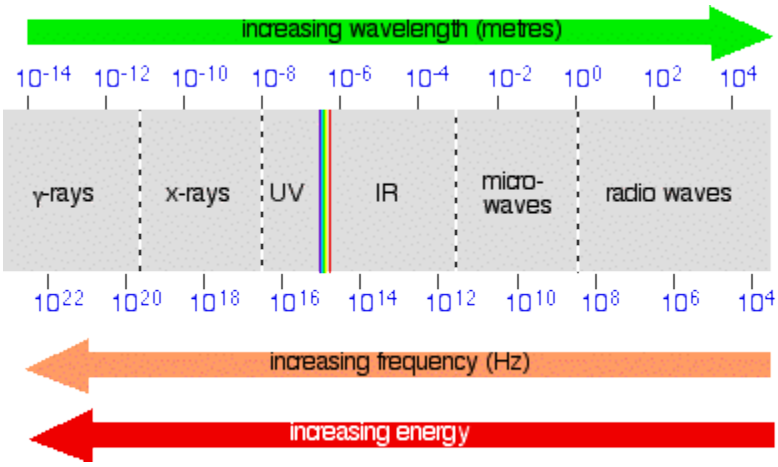



**15. Rank these parts of the electromagnetic spectrum from lowest energy (1) to highest (7):**

**Gamma Infrared Microwave Radio Visible Ultraviolet X-ray**

**Rank these parts of the electromagnetic spectrum from lowest frequency (a) to highest (g):**

**Gamma Infrared Microwave Radio Visible Ultraviolet X-ray**

**Rank these parts of the electromagnetic spectrum from shortest wavelength (A) to longest (G):**

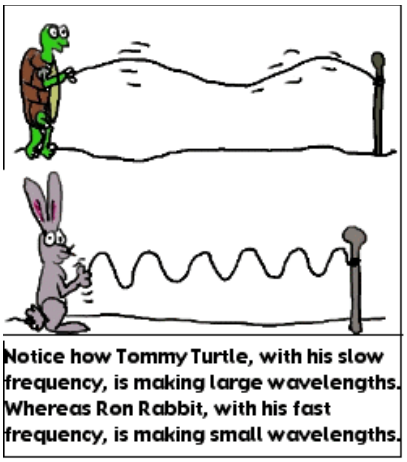
**Gamma Infrared Microwave Radio Visible Ultraviolet X-ray**

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

_____

**What is the relationship between frequency and energy? (Direct or Inverse)**

_____



Notice how Tommy Turtle, with his slow frequency, is making large wavelengths. Whereas Ron Rabbit, with his fast frequency, is making small wavelengths.