Practice Problems: ***Wavelength, Frequency, Energy. MORE PRACTICE – Thanks Avery !***

1. A certain green light has a frequency of 2.45 x $10^{14}$ Hz. What is the wavelength of the light?

$$C = \lambda \nu$$

$$\lambda = \frac{C}{\nu} = \frac{3.00\times10^{8}\ \frac{m}{\text{sec}}}{2.45\times10^{14}\ \frac{1}{\text{sec}}} = \frac{3.00\times10^{8}\ m\ (\text{sec})}{2.45\times10^{14}\ (\text{sec})} = 1.22\times10^{-6} m$$

c = $\lambda\nu$

E = $h\nu$

c = 3.00 x $10^{8}$ $^{m}/_{sec}$

$h$ = 6.626 x $10^{-34}$ J • sec

Hz = $^{1}/_{sec}$

2. What is the energy of a quantum of light from question 1?

$$E = h\nu$$

$$E = h\nu = \frac{\left(6.626\times10^{-34} J\cdot\text{sec}\right)}{}\left(\frac{2.45\times10^{14}}{(\text{sec})}\right) = 1.62\times10^{-19}\ J$$

3. What is the energy of a quantum of light with a frequency of 3.87 x $10^{19}$ Hz?

$$E = h\nu$$

$$E = h\nu = \frac{\left(6.626\times10^{-34} J\cdot\text{sec}\right)}{}\left(\frac{3.87\times10^{19}}{(\text{sec})}\right) = 2.56\times10^{-14}\ J$$

4. What is the wavelength of the quantum of light in question 3?

$$C = \lambda \nu$$

$$\lambda = \frac{C}{\nu} = \frac{3.00\times10^{8}\ \frac{m}{\text{sec}}}{3.87\times10^{19}\ \frac{1}{\text{sec}}} = \frac{3.00\times10^{8}\ m\ (\text{sec})}{3.87\times10^{19}\ (\text{sec})} = 7.75\times10^{-12} m$$

5. A certain red light has a wavelength of 1250 nm. What is the frequency of the light?

$$C = \lambda \nu$$

$$\frac{1250\ nm}{} \times \frac{1\ m}{10^9\ nm} = 1.25 \times 10^{-6} m$$

$$\nu = \frac{C}{\lambda} = \frac{3.00 \times 10^8 \frac{m}{\sec}}{1.25 \times 10^{-6} m} = \frac{3.00 \times 10^8\ m}{1.25 \times 10^{-6}\ m\ (\sec)} = 2.40 \times 10^{14}\ \frac{1}{\sec}$$

6. What is the energy of a quantum of light from question 5?

$$E = h\nu$$

$$E = h\nu = \frac{\left(6.626 \times 10^{-34} J \cdot \sec\right)}{}\left(\frac{2.40 \times 10^{14}}{(\sec)}\right) = 1.59 \times 10^{-19}\ J$$

7. The wavelength for a certain photon of light is 866 nm. What is the energy of this light?

$$\frac{866\ nm}{} \times \frac{1\ m}{10^9\ nm} = 8.66 \times 10^{-7} m$$

$$C = \lambda \nu$$

$$\nu = \frac{C}{\lambda} = \frac{3.00 \times 10^8\ m}{8.66 \times 10^{-7}\ m\ (\sec)} = 3.46 \times 10^{14}\ \frac{1}{\sec}$$

$$E = h\nu$$

$$E = h\nu = \frac{\left(6.626 \times 10^{-34} J \cdot \sec\right)}{}\left(\frac{3.46 \times 10^{14}}{(\sec)}\right) = 2.30 \times 10^{-19}\ J$$