Warm-Up #20 Name:_____ Date:_____

1. Calculate the wavelength ($\lambda = ?$) of X-rays having a frequency of 4.80×10^{17} Hz.

given: $\nu = 4.80 \times 10^{17}\ Hz = 4.80 \times 10^{17}\ \frac{1}{s}$

want: $\lambda = ?$

$$c = \lambda \nu$$

$$\frac{3.00 \times 10^{8}\ \frac{m}{s}}{4.80 \times 10^{17}\ \frac{1}{s}} = \frac{(\lambda)(4.80 \times 10^{17}\ \frac{1}{s})}{4.80 \times 10^{17}\ \frac{1}{s}}$$

$$\lambda = 6.25 \times 10^{-10}\ m$$

2. Calculate the energy ($E = ?$) of a gamma ray photon whose frequency (ν) is 5.02×10^{20} Hz.

given: $\nu = 5.02 \times 10^{20}\ Hz = 5.02 \times 10^{20}\ \frac{1}{s}$

want: $E = ?$

$$E = h\nu$$

$$E = (6.626 \times 10^{-34}\ J \cdot s)(5.02 \times 10^{20}\ \frac{1}{s})$$

$$E = 3.33 \times 10^{-13}\ J$$

3. Calculate the energy ($E = ?$) of a radio wave that has a wavelength (λ) of 150 m.

given: $\lambda = 150\ m$

want: $E = ?$

$E = h\nu$ ★ Must calculate ν first

$$c = \lambda \nu$$

$$\frac{3.00 \times 10^{8}\ \frac{m}{s}}{150\ m} = \frac{(150\ m)(\nu)}{150\ m}$$

$$\nu = 2000000\ \frac{1}{s} = 2.0 \times 10^{6}\ \frac{1}{s}$$

$$E = h\nu$$

$$E = (6.626 \times 10^{-34}\ J \cdot s)(2.0 \times 10^{6}\ \frac{1}{s})$$

$$E = 1.3 \times 10^{-27}\ J$$