Name: _____ **Date:** _____

Worksheet: Wavelength & Energy Calculations

Equations and Constants:

$E = hf$	$E = \frac{hc}{\lambda}$	E = energy of one photon (J), h = Planck's constant = 6.626×10^{-34} J·s
$c = 3.0 \times 10^8$ m/s	$1\ \text{eV} = 1.6 \times 10^{-19}$ J	f = frequency (Hz), λ = wavelength (m), c = speed of light = 3.0×10^8 m/s

Electromagnetic Spectrum (Wavelength, m)

Radio: > 10^{-1}	Microwave: 10^{-1} to 10^{-3}	Infrared: 10^{-3} to 7.0×10^{-7}
Visible: 7.0×10^{-7} to 4.0×10^{-7}	Ultraviolet: 4.0×10^{-7} to 10^{-8}	X-Rays: 10^{-8} to 10^{-11}
Gamma Rays: < 10^{-11}		

Word Bank: Choose your answer!

1. A photon has a frequency (f) of 2.998×10^{8} Hz. Calculate the energy.

2. Calculate the energy (E) and wavelength (λ) of a photon of light with a frequency (f) of 5.000×10^{14} Hz.

3. Calculate the frequency and the energy of blue light that has a wavelength of 4000 Å nm.

4. Calculate the wavelength and energy of light that has a frequency of 1.2×10^{15} Hz.

5. A photon of light has a wavelength of 5.8×10^{-7} m. Calculate the energy.

6. Calculate the number of photons having a wavelength of 3.0×10^{-7} m are required to produce 1.0 kJ of energy.

7. Calculate the total energy in 1.5×10^{17} photons of gamma radiation having $\lambda = 5.0 \times 10^{-11}$ m.

8. Calculate the energy and frequency of red light having a wavelength of 6.8×10^{-7} m.

9. The wavelength of green light from a traffic signal is centered at 5.2×10^{-7} m. Calculate the frequency.

10. Calculate the frequency of light that has a wavelength of 9.2×10^{-2} m. Identify the type of electromagnetic radiation.