Honors Chemistry: Atomic Theory 12 Problem Set – Light and Planck's Equation

1. Complete the table below. You will need to use the electromagnetic spectrum and Plank's light equations. The spectrum can be found under the "additional resources" section.

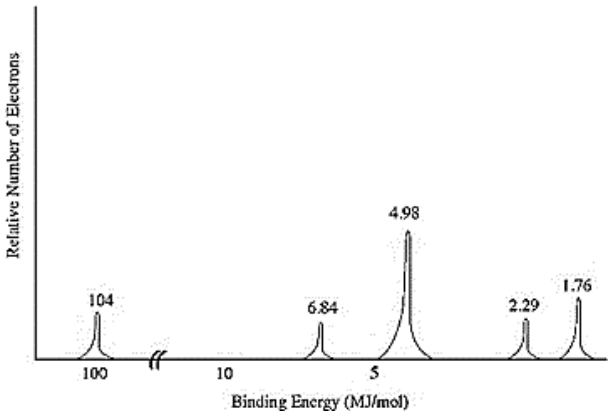
Energy (Joules)	Wavelength-λ (meters)	Frequency –ν (s^{-1})	Color of Light/type of electromagnetic radiation
6.3×10^{-19} J			
	2.4×10^{-7} m		
		100 s^{-1}	
1.5×10^{-14} J			
	5.6×10^{-10} km		
		2.2×10^{13} s^{-1}	
	525 nm		

2. A wave propagates through a medium with a wavelength of 3.5×10^{-5} m. (a). How much energy does a single photon contain? (b). How much energy, in kJ, does a mole of photons contain? (c). Calculate the frequency for this wave.

3.(a). Examine the photoelectron spectra. Identify this element and calculate the effective nuclear charge. (Z_{eff} = Z-s) (b). Calculate the amount of energy, in kJ, required to remove a single valence electron from the p-subshell for this element.

(a).

(b).



4. A total of 155 kJ/mol of energy is required to break the bond of diatomic fluorine (F_2). What frequency of a photon would have enough energy to cleave this F-F bond?

ANSWERS: 2a. 5.7×10^{-21} J 2b. 3.4 kJ/mol 2c. 8.6×10^{12} Hz. 3a. +5 3b. 2.92×10^{-21} kJ/electron 4. 3.88×10^{14} Hz.