Electromagnetic Radiation & Energy Levels

$\mathbf{c} = 3.00 \times 10^{8}$ m/sec $\quad \mathbf{h} = 6.63 \times 10^{-34}$ J·sec $\quad N_A = 6.02 \times 10^{23}$

pico(p) = 10^{-12} $\quad$ nano(n) = 10^{-9} $\quad$ micro(μ) = 10^{-6} $\quad$ milli(m) = 10^{-3}

$\mathbf{c} = \lambda\nu$ $\quad E_{photon} = \mathbf{h}\nu$

Fill in the Table below using the electromagnetic radiation equations.

	wavelength (λ) (use meters in eqn)	frequency (ν) (sec^{-1})	E_{photon} (Joules)	ΔE transition (kJ/mole)
microwave	**10 mm**			
	1 mm			
infrared	**16 μm**			
	1 μm			
	700 nm			
red				
	650			
orange				
	600			
yellow				
	550			
green				
	500			
blue				
	450			
violet				
	400			
ultraviolet	**400 nm**			
	100 nm			

Quantum mechanics and electron energy levels.

The first four energy levels in a hydrogen atom have energies of -2.20×10^{-18} J, -5.50×10^{-19} J, -2.44×10^{-19} J, and -1.38×10^{-19} J.

1) Calculate the photon energies of emitted radiation as an excited electron drops from levels 4 ➔ 1, 3 ➔ 1 and 2 ➔ 1.

2) Calculate the wavelengths of light corresponding to those transitions in 1.

3) Calculate ΔE in kJ/mole H for those transitions in 1.

4) Calculate E_{photon}, λ, and ΔE in kJ/mole H, for and electron absorbing energy and going from level 2 ➔ 3.