**Quiz 2 Chemical Principles I Chem 1984 Fall 2013**

**Metric-Metric conversions, wave equation, Planck’s equation \_\_\_\_\_/30**

**Your name: \_\_\_\_\_\_\_\_\_\_answers\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2.1. Metric-metric conversions (3 pts each/9 pts total)**

**Convert:**

**10 ms 🡪 \_\_\_\_\_\_\_\_\_1\_\_\_\_\_\_\_\_\_cs 10 m/c = 10\*10-3/10-2 = 1**

**0.23 ng 🡪 \_\_\_\_\_\_\_230\_\_\_\_\_\_\_\_ pg 0.23 ~~ng~~ \* 10-9 ~~g~~/1 ~~ng~~ \* 1 pg/10-12 ~~g~~ = 230**

**400 km 🡪 \_\_\_\_\_\_\_\_\_0.4\_\_\_\_\_\_\_Mm k=>3 🡪 M=>6 (3-6) =-3=x, 400 km = 400 \*10x = 400\*10-3 =0.40**

**2.2. Waves and the Wave equation ( 5 pts total)**

**8 cm**

For the light wave drawn , given that c=3\*108 m/s**:**

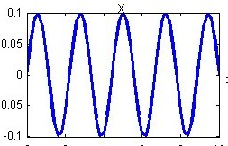
1. **Compute the wavelength λ in meters (m): λ= \_\_\_\_\_0.02\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (2 pts)**

**8 cm/4 waves = 2 cm/wave =0.02 m/wave**

1. **Compute the frequency f in GHz:**

**f= \_\_\_\_\_\_\_15\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ GHz (3 pts)**

**f=c/λ(m)=3\*108/0.02=1.5\*1010Hz =15 GHz**

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**2.3. frequency- wavelength conversions (4 pts each/8 pts total)**

Given that c=3\*108 m/s, convert the following light frequencies or wavelengths to their equivalent wavelengths or frequencies in the units indicated.

1. **600 MHz** 🡪 **\_\_\_\_\_\_\_\_\_50\_\_\_\_\_\_\_\_\_\_\_\_ cm (4 pts) λ= 3\*108/(600\*106) m =0.5 m =50 cm**
2. **100 mm** 🡪 **\_\_\_\_\_\_\_\_\_\_\_3\_\_\_\_\_\_\_\_\_\_\_\_\_ GHz (4 pts) f(Hz) =3\*108/100\*10-3 m=3\*109 Hz =3 GHz**

**2.4. Planck’s law computations: ( 4 pts each/8 pts total)**

Given that**: E (J) /photon = hf= 6.63\*10-34 \*f(Hz) , c= 3\*108 m/s , hc=1.989\*10\_25 J-m**

1. Compute the energy of a 150.8 GHz photon in Joules (J) : **E/photon = \_\_\_1.0\*10-22\_\_\_\_\_J (2 sig figs)**

**hf= 6.634\*10-34 \*150.8\*109 = 1.0\*10-22 J**

1. A photon has 3.978\*10-26 J of energy. What is its’ wavelength in meters ?

**hf= hc/λ= 1.989\*10-25/λ= E=3.978\*10-26**

**λ= 1.989\*10-25 /3.978\*10-26 = 5 m**

**λ=\_\_\_\_5\_\_\_\_\_\_\_\_\_ m (2 sig figs)**