

CHM 598, Photochemistry, Spring 2005

Homework 1, due Jan 27th

1. Give values for the following physical constants

i) speed of light, c (cm s^{-1})

ii) Avagadro's number, N

iii) Planck constant, h (J s)

2. Give the energy of the following Irradiation wavelengths in kJ/mol , kcal/mol , cm^{-1} , eV

i) 184.7 nm

ii) 253.7 nm

iii) 366.0 nm

3. A medium pressure mercury lamp with a filter solution gives 2 watts of energy at 313 nm. Assume all of this light is absorbed by the sample, how many seconds will it take for 10^{-3} moles of product to be formed if each photon absorbed converts one molecule of starting material into product?

4. A laser emits pulses of light of 355 nm in 10 ns, at a rate of 10 Hz (10 pulses per second). Each pulse has an energy of 10 mJ. Calculate the average power of the laser in Watts, the peak power of the laser, the number of photons in each pulse. The beam is used to excite a sample contained in a 1 cm^2 cuvette. Assume the beam is round with a radius of 1 mm, and that in the cell, 90% of the light is absorbed. What is the average concentration (moles/L) of excited states that are formed in the cell with each pulse?