PHYSICS-2

Elementary Physics of Energy

Homework 7

Due Date: May 25, 2012

This set of problems has no correspondence to those in RK, but are based on class notes and the newly put hand outs qm_1.pdf and qm_2.pdf is in the "Resources" folder. If necessary, you can look up the other books on reserve.

1. Find the number of photons at wavelengths $\lambda = 5000, 1000$ *and* $10\ A^0$ needed to increase the temperature of 1 gm of water by 1 degree celsius assuming full absorption of light. [20]

2. Assuming the full solar constant value of 2 cal per minute square cm, and assuming that the sun transmits at a wavelength $\lambda = 5500\ A^0$ find the number of photons per second per square meter are incident on earth. [20]

3. In the above problem, assuming that each photon creates an electron and a hole, calculate the current due to both electrons and holes per square meter of the solar cell panel. In real life we would only get about 5% of this value due to the reduction of the solar constant and also the efficiency of the solar cells. [25]

   { Hint Take the charge of the electron as equal and opposite in sign to that of the hole with magnitude 1.6×10^{-19} Coulomb and use the definition of current in amperes as Coulombs per sec.}

4. In the design of a solar cell panel, assume an insolation of 1520 Btu per sq foot, and must to compute how many square meters of panels are needed, assuming an efficiency of 15%, to satisfy the needs of a home that heats 45 gallons of water per day through 10^0F . [25]

5. Two distant stars appear yellow and blue in color. Estimate their temperatures assuming black body radiation of Planck. [10]