Problem Set #1

Due Monday, March 3 by 5pm to Dickinson 104

Unless otherwise indicated, all problems come from "Quantum Physics: A Fundamental Approach to Modern Physics"

1. Problem 1.1
2. Problem 1.4
3. Problem 1.5
4. Problem 1.10
5. Problem 1.17
6. The work function of cesium is 1.9 eV. This is the lowest value work function of any metal, and consequently, cesium is used in photomultiplier tubes, a kind of visible light detector so sensitive that single photons can be readily detected.
    a. What is the maximum wavelength of light that can eject photoelectrons from cesium?
    b. If light with wavelength of 500 nm strikes cesium, what is the kinetic energy of the ejected electrons?
7. On a single graph, make plots of the Planck distribution function (Equation 7.61) for temperatures T = 1000 K and T=1500 K. Comment. (Where do the two graphs peak? How do the total radiated powers compare?)
8. A flashlight beam produces 2.5 W of electromagnetic radiation in a narrow beam. Although the light it produces is white (all visible wavelengths), make the simplifying assumption that the wavelength is 550 nm, the middle of the visible spectrum.
    a. How many photons per second emanate from the flashlight?
    b. What force would the beam exert on a "perfect" mirror (i.e. one that reflects all light completely)?