

Homework one (Phys 460) (due day: Sep. 15)

- Problem 1
A photon which is emitted by an atom imparts an equal and opposite momentum to the atom.
 - a. What is the kinetic energy transferred to the atom if the frequency of the photon is ν and the mass of the atom is M ?
 - b. How much energy is transferred to the Hg atom in the emission of the mercury spectral line $\lambda = 2357\text{\AA}$?
- Problem 2 What is the relation between the potential energy and the kinetic energy in a circular Bohr orbit? Derive a relationship between them.
- Problem 3
A "Positronium" is a bound electron-positron pair. The positron is the anti particle corresponding to the electron. It has a charge $+e$ and the same rest mass as the electron. On the assumption that the electron and positron, in analogy to the H atom, circle the common center due to the static coulomb interaction between them, calculate the rotational frequency, the radius and the binding energy of the system in the ground state based on Bohr's theory.
- Problem 4
Assuming a positronium in the ground state collapses and becomes two photons with an identical frequency due to unknown reason, calculate the frequency of the photons.
- Problem 5-9:
Problem 1.14, 1.15, 1.16, 1.17, 1.18 in Griffiths's book.