HW 4. Due Thu Oct 11 at 10 a.m. in my mailbox

Problem 1.

Electron in the first Bohr orbit (with $n = 1$) of hydrogen atom absorbs photon with energy 1.936×10^{-18}J. On which stationary orbit it will end up?

Problem 2

Problem 4.41:

(a) The current i due to a charge q moving in a circle with frequency f_{rev} is qf_{rev}. Find the current due to the electron in the first Bohr orbit of hydrogen atom.

(b) The magnetic moment of a current loop is iA, where A is the area of the loop. Find the magnetic moment of the electron in the first Bohr orbit in units A·m^2. This magnetic moment is called a *Bohr magneton*.

Problem 3.

Problem 4.44:

Consider the Franck-Hertz experiment with Hg vapor in the tube and the voltage between the cathode and the grid equal to 4.0 V, i.e., not enough for the electrons to excite the Hg atom's first excited state. Therefore, the electron-Hg atom collisions are elastic.

(a) If the kinetic energy of the electrons is E_k , show that the maximum kinetic energy that a recoiling Hg atom can have is approximately $4mE_k/M$, where M is the Hg atom mass.

(b) What is the approximate maximum energy that can be lost by an electron with $E_k =$ 2.5eV?