

## Physics 390: Homework set #4

Due Wednesday March 8, 2006

**Reading:** Tipler & Llewellyn, Chapter 7

**Note:** Problems in **parentheses** are optional and will not be graded!

### Questions:

- (1.) The  $2s$  electron has a greater probability to be close to the nucleus than the  $2p$  electron, and also a greater probability to be farther away (see Figure 7-10a). Make an analogy to classical orbits to explain how this is possible.
2. Spherical harmonics, which are eigenfunctions of angular momentum, contain the imaginary number  $i = \sqrt{-1}$  (see Table 7-1). Is it all right for a function that is supposed to be associated with observable quantities to contain imaginary numbers? Why or why not?
3. Consider a penny spinning about an axis through its center at the rate of a few revolutions per second. Estimate the value of  $l$ .

**Problems:** 1, 13, (15) 23, 31, 36, 42, (45,) 68, 75