Final Hydrogenization

Lecture 25

Physics 342
Quantum Mechanics I

Wednesday, March 31st, 2010

We finish our discussion of the Hydrogen atom. In particular, we will look at the degeneracy of the energy states of Hydrogen, and this motivates our interest in operators that commute with the Hamiltonian (and each other) – with enough operators we can experimentally pin down the state of the electron.

In Figure 25.1, we see a planar slice of the densities (there is symmetry here) associated with the wavefunctions shown. Lighter areas correspond to higher probability density.

Homework

Reading: Griffiths, pp. 145–159.

Problem 25.1

Griffiths 4.17. The gravitational analogue of Hydrogen.

Problem 25.2

Griffiths 4.25. Classical angular momentum of an electron.

Problem 25.3

Griffiths 4.43 a and b only. Practice constructing and calculating with the stationary states of Hydrogen.

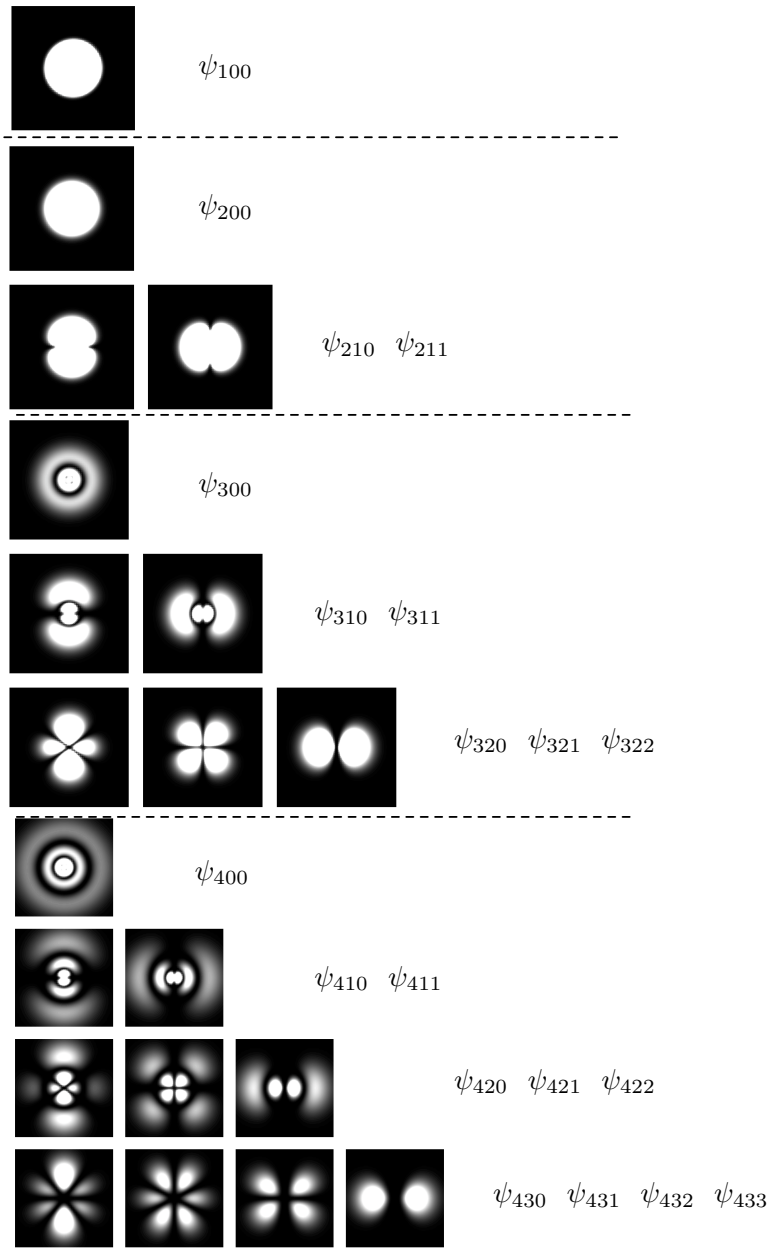

Figure 25.1: The probability densities for the indicated wavefunctions. Here, we are looking at the density in the y-z plane, and all plots have the same horizontal and vertical extent.