Quantum Mechanics Fall 2003- Homework Set 8

Time Independent Perturbation Theory

Due 5:00pm Weds. Dec. 3 if you want it back before the final. Due Monday Dec. 8 if you don't care.

6.1 Ground state shift

6.2

6.3

6.9 Degenerate Perturbation

6.13 SHO Relativistic Correction(Do Ground State Only)

6.15 Fine Structure Formula(Do $j = \ell + 1/2$) case only).

6.18 Internal Field of Hydrogen

6.19 Weak Zeeman Splitting

Review Problems from Cohen-Tannoudji

Consider a particle in the state

$$\psi = N(x + y + z)e^{-r/\alpha}$$

where N is a normalization and α is a constant. What values of angular momentum (ℓ and m) can be observed with what probability? Hint: You must express x, y, and z in spherical coordinates. Calculate N and the expectation values of r and r^2.