Quiz #8

Friday, October 20

PHYSICS 851, FALL 2000

1. Find the Clebsch-Gordan coefficient

$$\langle \ell = 1, s = 1/2, J = 1/2, M = 1/2 | \ell = 1, s = 1/2, m_\ell = 1, m_s = -1/2 \rangle$$

2. An electron is in an $\ell = 1$ state of a hydrogen atom. It experience a spin orbit interaction,

$$V_{\text{s.o.}} = \alpha \mathbf{L} \cdot \mathbf{S}$$

and also feels an external magnetic field

$$V_b = -\mu \mathbf{B} \cdot (\mathbf{L} + 2\mathbf{S}) \, .$$

   (a) If the magnetic field is zero, what are the energy levels? Note the degeneracy of each level.

   (b) If the field is non-zero but the spin-orbit coupling is neglected ($\alpha = 0$), what are the energy eigenvalues? Again, note the degeneracy of each level.