

Worksheet # 16

Friday, March 15, 2024

Name**Questions (5 pts):**

We will use time-independent perturbation theory to derive first-order energy corrections to the ground-state of the hydrogen atom due to the hyperfine interactions.

1. Given the perturbation potential, do we use non-degenerate or degenerate perturbation theory? What is our “unperturbed” state?
2. Calculate $\langle 1,0,0|Y_2^q|1,0,0\rangle$, where $q = 0, \pm 1, \pm 2$.
3. Sketch the energy level diagram after the hyperfine structure is accounted for. Label the states. Are all degeneracies removed?