QUANTUM MECHANICS I

PHYS 516

Problem Set # 4

Distributed: Feb. 10, 2014

Due: February 19, 2014

1. Stark Effect — $N = 2$: A hydrogen atoms finds itself in a constant uniform electric field $\mathcal{E}$.

a. Compute the energy levels of the $N = 2$ multiplet.

b. What resonance frequency should be used to incite transitions among these levels if $\mathcal{E} = 1000$ V/cm.? Give answer in Hz.

2. $E1$ **Transitions and Polarization:** Transitions from the four levels of the Stark-split $N = 2$ levels to the $1S$ ground state can take place with polarization in the x-, y-, and z-directions.

a. Compute the transition probability amplitude for each of the three polarization directions from each of the four $N = 2$ states. Organize your results in tabular form:

State Polarization	*	*	*	*
x				
y				
z				

3. Stark Effect — $N = 3$: A hydrogen atoms finds itself in a constant uniform electric field $\mathcal{E}$.

a. Compute the energy levels of the $N = 3$ multiplet.

b. What resonance frequency should be used to incite transitions among these levels if $\mathcal{E} = 1000$ V/cm.?