

Problems:

1-The state of a hydrogen atom is

$$\Psi = \frac{1}{\sqrt{2}}\psi_{1s} + A\psi_{2p} + \frac{1}{\sqrt{8}}\psi_{3s}$$

- a- Find the value of A so that the state is normalized.
- b- What is the average energy of the state.

2 - An electron in a hydrogen atom is in the state

$$\Psi_{nlm}(r, \theta, \phi) = R_{32}(r) \left[\frac{1}{\sqrt{6}} Y_{21}(\theta, \phi) + \frac{1}{\sqrt{2}} Y_{20}(\theta, \phi) + \frac{1}{\sqrt{3}} Y_{2-1}(\theta, \phi) \right]$$

- a- What is the energy of the electron?
- b- If L^2 is measured, What value can be found ?
- c- If L_z is measured, What values can be found and with what probabilities ? what is the expectation value of L_z .