

Homework IV - PHYS652

1. shankar: 15.1.1
2. shankar: 15.1.2
3. shankar: 15.2.2, only (1)
4. The spin-position state for an electron in the H-atom is given by
$$\Psi = R_{21}(\sqrt{2/3}Y_1^0\chi_+ + \sqrt{1/3}Y_1^1\chi_-).$$
 - (a) If you measure L^2 , what values can you get and with what probability?
 - (b) If you measure L_z , what values can you get and with what probability?
 - (c) If you measure S^2 , what values can you get and with what probability?
 - (d) If you measure S_z , what values can you get and with what probability?
 - (e) If you measure J^2 , what values can you get and with what probability?
 - (f) If you measure J_z , what values can you get and with what probability?
 - (g) If you measure the position of the particle, what is the probability density for finding it at r, θ, Φ ?
 - (h) If you measure concurrently S_z and the distance of the electron to the origin, what is the probability for finding the electron a distance r in the spin-up state? Why can you measure these 2 quantities in parallel?