Quantum Chemistry
Exercises 6

1. Calculate the probability that a hydrogen 1*s* electron will be found within a distance of $2a_0$ from the nucleus.

2. Calculate the radius of the sphere that encloses a 50% probability of finding a hydrogen 1*s* electron. Repeat the calculation for a 90% probability.

3. By evaluating the appropriate integrals, compute $\langle r \rangle$ in the 2*s*, the 2*p*, and the 3*s* states of the hydrogen atom. Compare your results to the general formula:

$$\langle r_{nl} \rangle = \frac{a_0}{2}\left[3n^2 - l(l+1)\right]$$