Homework 1

1. (30 points) Starting from the general form of the Schrödinger equation for the radial wave function obtain the solution for the case of Hydrogenlike atom.

2. (10 points) Calculate $R_{10}$

3. (10 points) Calculate $R_{20}$

4. (10 points) Calculate $R_{21}$

5. (10 points) Calculate RMS radius of the $R_{10}$ and $R_{20}$ states

6. (30 points) Obtain the explicit forms of the generators of rotation in spin half space. Obtain also the eigenstates and eigenvalues of $S^2$ and $S_z$ as well as $S_x$ and $S_y$ operators.