Any Questions?

What is the meaning of the uncertainty principle?

For which of these dynamic variables is there an uncertainty relation?

$$x, p_x$$

$$x, p_y$$

$$x, y$$

$$p_x, p_y$$

$$L^2, L_x$$

$$L_x, L_y$$

$$H, p_x$$

For a particle in a one dimensional box, what is the meaning of a superposition state?

$$\psi = \sqrt{\frac{1}{3}}\phi_1 + i\sqrt{\frac{2}{3}}\phi_3$$

Does the superposition state have a definite energy?

What value do you get if you measure the energy?

What value do you get if you measure the a second time?

For an electron in the ground state of the hydrogen atom, where is he electron?

What is the energy of a photon needed to measure the position of the electron to 1/10 of the Bohr radius (a_o = 0.05 nm, $\hbar c$ = 200 ev nm)?

Compare this photon energy to the ionization energy of hydrogen.

Compare the spacing of the energy levels for:

1. particle in a 1D box
2. 1D harmonic potential
3. 3D Coulomb potential

What quantum numbers specify a hydrogen atom energy eigenstate?

Does the electron in a hydrogen atom energy eigenstate have definite angular momentum?

Consider an electron in the hydrogen atom state

$$\psi_{n\ell m} = R_{n\ell} Y_{\ell m}$$

What is its energy?

What is its angular momentum?

What does the m label mean?

Consider an electron in the hydrogen atom state

$$\psi = \sqrt{\frac{1}{3}} R_{20} Y_{00} + i \sqrt{\frac{2}{3}} R_{21} Y_{11}$$

What is the expectation value of the energy?

What is the expectation value of the angular momentum?