

HW # 3. Chem 2430 – assigned Sept. 22, due Sept 30.

1. What is the binding energy in eV of positronium ( $e^-, e^+$ )? What is the first excitation energy?
2. Suppose you lived in a two-dimensional universe where even the H atoms are two-dimensional? Write down the Hamiltonian, and separate it if possible? You should be able to guess (and then confirm) the form of the wavefunction for the ground state. For this wavefunction calculate the energy of the ground state of the 2-D H atom.
3. If the first rotational transition of  $H_2$  occurs at  $X \text{ cm}^{-1}$ , what is the energy (in  $\text{cm}^{-1}$ ) of the first rotational transition in HD?