

Physics 492: Recitation #1
January 22, 2016

1. For an electron in a 3-dimensional cubic box, what size of box L corresponds to a ground state energy of $+13.6\text{eV}$?
2. Estimate the ground state of the electron if the electron were to be confined inside of the nucleus.
3. The carbon monoxide molecule absorbs radiation at a wavelength of 3.6 millimeters, corresponding to the excitation of the first rotational energy level from the ground state. The molecule can be taken to be a rigid rotor (dumbbell shape). The classical rotational energy of the rotor is $E = L^2/2I$ where L is the rotational angular momentum and I is the moment of inertia for rotation about an axis perpendicular to the molecular axis of symmetry. For the quantum rotor, angular momentum is quantized so that $L^2 = \hbar^2\ell(\ell + 1)$ where $\ell = 0, 1, 2, \dots$ (an integer). Calculate the molecular bond length.