Recitation #2
Quantum 522

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1. Consider a classical orbit of the electron around the proton. Use the Bohr quantization rule mvr = nħ to get an estimate of the radius of hydrogen. Next, use the viral theorem $\langle T\rangle = -\frac{1}{2}\langle V\rangle$ to show $\langle 1/r\rangle = 1/(a_0 n^2)$. Use Kramer's relation with $s = 1$ to get the $\langle r\rangle$, $\frac{2}{n^2}\langle r\rangle - 3a_0 + (\ell(\ell+1)\, a_0^2\langle 1/r\rangle = 0$

2. The H_α line corresponds to the transition from the $n = 3$ to $n = 2$ energy levels in hydrogen. Calculate the fractional splitting of this line due to deuterium. ($m_p/m_e = 1836$.)