

Chemistry 2720 Fall 2003 Quiz 8

Name: _____

Calculate (in symbolic form, i.e. without substituting in the values of fundamental constants) the size of the orbital angular momentum vector of an electron in a 2p state using the correct modern quantum mechanical theory. Suppose that electrons moved in circular orbits as proposed by Bohr. Then the orbital angular momentum would be $L = rp$, where r is the radius of the orbit and p is the momentum of the electron. From the quantization condition for Bohr orbits, it's possible to obtain L almost directly.¹ Do the two calculations of L agree? What does the (dis)agreement tell us about the behavior of electrons in an atom?

¹In fact, Bohr originally assumed that L was quantized, which gives an equation which is exactly equivalent to de Broglie's quantization based on the standing wave condition.