The Bohr Model with Electron Spin

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Abstract

If we imbue Bohr's electron in the hydrogen atom with spin, the total energy number *n* consists of the electron's spin energy and the electron's orbital energy. If we define the spin energy number to be ½, then the orbital energy number is (*n*-½).

The principal quantum number *n* is a total energy number. Since we now know that the electron in the hydrogen atom has spin, we can define a spin energy number. We will define that spin energy number to be ½.

Assigning a spin energy number to the Bohr electron in the hydrogen atom necessitates that we designate an orbital energy number. We assign the orbital energy number to be (*n*-½). In the Bohr atom, the orbital energy number is always half-integer. We list a few of its values in the following table:

Table 1

When *n* equals	Orbital energy number is
1	1/2
2	3/2
3	5/2
4	7/2

We observe from Table 1 that there is only one value for the orbital energy number for each *n*. When *n*=1, for instance, we note that half the electron's energy is due to spin, and half is due to the electron's revolution in the orbit.

If we contrast Bohr hydrogen with the Schrődinger model of the hydrogen atom, we find that the Bohr model has circular orbits and therefore a least value of $\frac{1}{2}\frac{h}{2\pi}$ for orbital angular momentum. The Schrődinger model, on the other hand, allows a zero value for the least orbital angular momentum. We emphasize that the Bohr model does not allow a zero value for orbital angular momentum. There is no such thing as zero orbital angular momentum in the Bohr atom.

Bibliography

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