The Schrődinger Equation Did Not Confirm the Bohr Theory's Form for the Angular Momentum

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Abstract

A cursory glance at a popular website consulted by students and interested readers alike revealed a glaring error that requires immediate fixing.

The website says the Schrődinger equation confirmed the Bohr form $L = mvr = nh/2\pi$ as the orbital angular momentum of the electron in orbit in the hydrogen atom. That is not true. The Schrődinger orbital angular momentum form is $\sqrt{l(l+1)}\hbar$. According to the statement on the website, the student or other interested reader would be led to conclude that $n = \sqrt{l(l+1)}$, which, as we know, is not true. Serendipitously, the Bohr form contains the electron spin, but the Schrődinger form does not. The only equality possible with Bohr's *n* is when we add the square of the electron spin under Schrődinger's radical,

$$\sqrt{l(l+1)+(\pm ½)^2} = n \tag{1}$$

which produces

$$(l+½) = n \tag{2}$$

We see therefore that the Bohr angular momentum is

$$L = mvr = \frac{nh}{2\pi} = (l+½)\hbar \tag{3}$$

Reference

http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/qangm.html