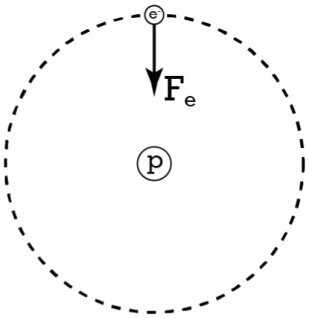
Flipping Physics Lecture Notes:

Determining the Speed of the Electron
in the Bohr Model of the Hydrogen Atom
https://www.flippingphysics.com/electron-speed-bohr.html



Assuming a circular orbit of the electron about the nuclear proton in the Bohr model of the hydrogen atom, determine the speed of the electron. The electron orbits at a radius of 5.29 x 10^{-11} m.

Draw free body diagram of the electron.
Only one force, the electric force, inward toward the proton.

$$r_{orbit} = 5.29\times10^{-11} m;\ v_t = ?\left(\text{magnitude}\right)$$

$$\sum F_{in} = F_e = ma_c \Rightarrow \frac{kq_1q_2}{r^2} = m\left(\frac{v_t^{\,2}}{r}\right) \Rightarrow \frac{kq_1q_2}{r} = mv_t^{\,2} \Rightarrow v_t = \sqrt{\frac{kq_1q_2}{mr}}$$

$$\Rightarrow v_t = \sqrt{\frac{\left(8.99\times10^{9}\right)\left(1.60\times10^{-19}\right)^2}{\left(9.11\times10^{-31}\right)\left(5.29\times10^{-11}\right)}} = 2.1853\times10^{6}\,\frac{m}{s} \approx \boxed{2.19\times10^{6}\,\frac{m}{s}}$$

$$v_t = 2.1853\times10^{6}\,\frac{m}{s}\left(\frac{3600 sec}{1 hour}\right)\left(\frac{1 mile}{1609 m}\right) \approx 4.89\times10^{6}\,\frac{mi}{hr}$$