14. A single electron orbits a lithium nucleus that contains three protons (+3*e*). The radius of the orbit is 1.76 x 10^{-11} m. Determine the kinetic energy of the electron.

$$\sum F_R = F_{El} = k\frac{q_{nucleus}q_{e^-}}{r^2} = k\frac{(3e)(e)}{r^2} = 3k\frac{e^2}{r^2} = m_e\frac{v^2}{r}$$

Solve for mv^2

$$m_e\frac{v^2}{r} = 3k\frac{e^2}{r^2}$$

$$m_e v^2 = 3k\frac{e^2}{r}$$

So kinetic energy is

$$K = \frac{1}{2}m_e v^2 = \frac{3}{2}k\frac{e^2}{r} = \frac{3}{2}\left(8.99\ x\ 10^9\ {Nm^2}/{C^2}\right)\frac{(1.60\ x\ 10^{-19}C)^2}{1.76\ x\ 10^{-11}m}$$

$$K = \left(1.349\ x\ 10^{10}\ {Nm^2}/{C^2}\right)\left(1.4545\ x\ 10^{-27}\ {C^2}/{m}\right) = 1.962\ x\ 10^{-17}J$$

$$K = 1.962\ x\ 10^{-17}J\ x\ \left(\frac{1\ eV}{1.60\ x\ 10^{-19}J}\right) = 122.6\ eV$$

$$\boxed{K = 1.96\ x\ 10^{-17}J\ = 123\ eV}$$

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