

Coulomb's Law Application problem #1
 An electron orbits around a nucleus of lithium.

Find a) F_{cp} b) v c) Period of orbit T

$e^- = 1.6 \times 10^{-19} C$
 $p^+ = +1.6 \times 10^{-19} C$

$r = 0.5 \times 10^{-10} m$
 $m_e = 9.1 \times 10^{-31} kg$

a) $F_{cp} = \frac{k Q_1 Q_2}{r^2} = \frac{k Q_1 Q_2}{d^2}$
 $= \frac{(9.0 \times 10^9)(1.6 \times 10^{-19})(+3 \times 1.6 \times 10^{-19})}{(0.5 \times 10^{-10})^2}$
 $= -2.77 \times 10^{-7} N$

b) $(2.77 \times 10^{-7} N) = \frac{m v^2}{r}$
 $v^2 = \frac{(2.77 \times 10^{-7} N)(0.5 \times 10^{-10} m)}{9.1 \times 10^{-31} kg}$
 $\sqrt{v^2} = \sqrt{1.52 \times 10^{13}}$
 $v = 3.9 \times 10^6 m/s$

c) $T = ?$
 $v = \frac{2 \pi r}{T}$
 $T = \frac{2 \pi r}{v} = \frac{2 \pi (0.5 \times 10^{-10} m)}{3.9 \times 10^6 m/s}$
 $T = 8.05 \times 10^{-17} s$

Dec 12-1:10 PM