Answer on Question #73702, Physics / Other

An electron and a proton moving with equal velocity enter a region of uniform perpendicular magnetic field. Calculate the ratio of the radii of their circular paths in the field.

Solution:

The Lorentz magnetic force supplies the centripetal force, so:

$$qvB = \frac{mv^2}{r}$$

Thus, the radius is

$$r = \frac{mv}{qB}$$

The mass of the electron is m = 9 x 10^{-31}k g

Mass of proton: Mass of proton is 1.0072766 a.m.u. or 1.6726 x 10^{-27} kg.

Comparative mass: Proton is 1837 times heavier than an electron.

The electronic charge is e =p = 1.6 x 10^{-19}C

So, q, v and B are equal.

$$\frac{r_p}{r_e} = \frac{m_p}{m_e} = 1837$$

Answer: 1837.