Answer on question #59069, Physics / Electric Circuits

Question A proton is accelerated through a potential difference of 100V and the enters a region in which it is moving perpendicular to a magnetic field of flux density 0.20T. Find the radius of the circular path in which it will travel.

0.9km 0.7km 0.3km 0.5km

Solution The radius can be found from formula for Lorenz force

$$m\frac{v^2}{r} = qvB$$

where v is velocity of proton and B=0.2 T is magnetic field. Then

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

Velocity can be found from energy conservation.

$$mv^2/2 = qU$$

$$v = \sqrt{\frac{2qU}{m}} = \sqrt{\frac{2 \cdot 1.6 \cdot 10^{-19} \cdot 100}{1.6 \cdot 10^{-27}}} \approx 4.47 \cdot 10^4 m/s$$

Where U=100 V is potential difference. Hence

$$r = \frac{1.6 \cdot 10^{-27} \cdot 4.47 \cdot 10^4}{1.6 \cdot 10^{-19} \cdot 0.2} \approx 22.35 \cdot 10^{-4} \, m$$