

Ch. 11 Prob. 75

Same momentum

A has 4x the charge of B
What is the ratio of their radii?

Now $R = \frac{m v}{q B}$, so $R_A = \frac{m_A v_A}{q_A B_A}$

But both and $R_B = \frac{m_B v_B}{q_B B_B}$
experience the
same magnetic
field and have
the same momentum

$$B_A = B_B = B \text{ and } m_A v_A = m_B v_B = m v$$

$$\text{so } R_A = \frac{m v}{q_A B} \quad + \quad R_B = \frac{m v}{q_B B}$$

What is given is

$$q_A = 4 q_B \text{ so } R_A = \frac{m v}{4 q_B B}$$

Now set up the ratio

$$\frac{R_A}{R_B} = \frac{\frac{m v}{4 q_B B}}{\frac{m v}{q_B B}} = \frac{1}{4}$$

$\therefore R_A$ is 4x smaller than R_B