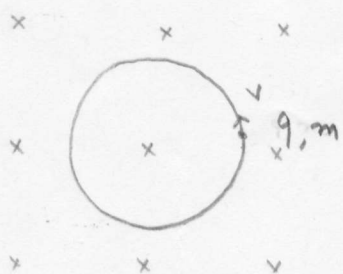


NAME: _____

Quiz #1:
Phys270

1. [10 pts] A particle with charge q and mass m is moving in a circular path perpendicular to a constant magnetic field. The particle takes a time T to complete one revolution. Determine the magnitude of the magnetic field in terms of q , m , and T .



The particle rotates in a circle w/ constant speed v making a radius say r .

Applying Newton's second law and

Lorentz force formula for magnetic field we have

$$m \times \text{centripetal acceleration} = \text{magnetic force}$$

$$\text{or, } m \frac{v^2}{r} = q v B$$

$$\text{or } m \left(\frac{v}{r} \right) = q B, \text{ dividing both sides by } v.$$

But $\frac{v}{r}$ is related to frequency, in fact, $\frac{v}{2\pi r} = \text{freq.} = \frac{1}{T}$

$$\text{or, } \frac{v}{r} = \frac{2\pi}{T}$$

$$\text{Hence, } m \cdot \frac{2\pi}{T} = q B$$

$$\text{or, } \boxed{B = \frac{2\pi m}{q T}}$$