

Problem 1) A particle of mass m carrying charge q_1 is revolving around a fixed charge $-q_2$ in a circular path of radius r . Calculate the period of revolution and its speed also.

Solution:-

$$\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2} = m r \omega^2 = \frac{4\pi^2 m r}{T^2},$$

$$T^2 = \frac{(4\pi\epsilon_0) r^2 (4\pi^2 m r)}{q_1 q_2} \quad \text{or} \quad T = 4\pi r \sqrt{\frac{\pi\epsilon_0 m r}{q_1 q_2}}$$

and also we can say that

$$\frac{q_1 q_2}{4\pi\epsilon_0 r^2} = \frac{m v^2}{r} \quad \Rightarrow \quad v = \sqrt{\frac{q_1 q_2}{4\pi\epsilon_0 m r}}$$