

Physics 102Rec  
Quiz#5  
Chapter 23

Name: Key Id#: \_\_\_\_\_ Sect#: \_\_\_\_\_

A charged plastic ball of mass 1 g is suspended by a light string in the presence of a uniform electric field given by  $\vec{E} = 3 \times 10^5 \hat{i}$  N/C. The ball is in equilibrium when  $\theta = 40^\circ$ . Find the charge on the ball

$$\left. \begin{array}{l} \sum F_x = 0 \\ \sum F_y = 0 \end{array} \right\} \text{because equilibrium}$$

$$\begin{aligned} \sum F_x &= qE - T \sin \theta = 0 \\ \Rightarrow T \sin \theta &= qE \quad (1) \end{aligned}$$

$$\begin{aligned} \sum F_y &= 0 = T \cos \theta - mg \\ \Rightarrow T \cos \theta &= mg \quad (2) \end{aligned}$$

divide  $\frac{(1)}{(2)} \Rightarrow \tan \theta = \frac{qE}{mg} \Rightarrow q = \frac{mg \tan \theta}{E}$

$$q = \frac{1 \times 10^{-3} \times 9.8 \times \tan 40^\circ}{3 \times 10^5} = \underline{\underline{2.74 \times 10^{-8} \text{ C}}}$$

