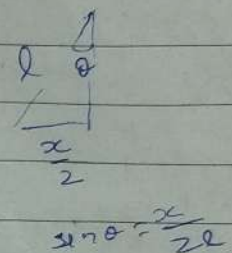
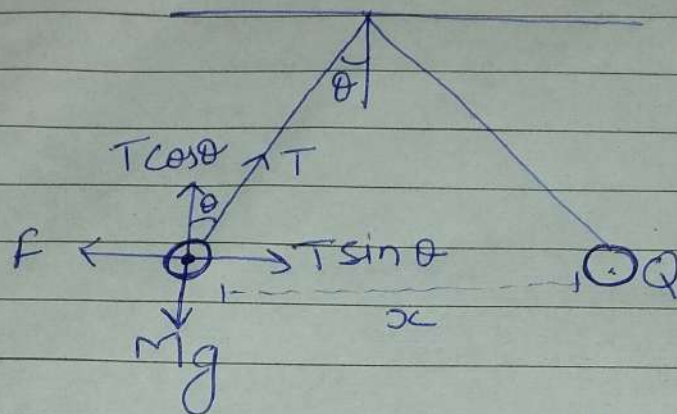


Q Two identical charged suspended from a common point by two massless string of length  $l$  are initially a distance  $d \ll l$  apart because of their mutual repulsion. The charge begins to leak from both the spheres at a constant rate. As a result the charge approach each other with a velocity  $v$ . Then find velocity ( $v$ ) as a fun of  $x$ .



$$\tan \theta = \frac{F}{Mg} \Rightarrow \theta = \frac{F}{Mg} \Rightarrow F = Mg\theta$$

So,

$$\frac{KQ^2}{x^2} = Mg \frac{x}{2l}$$

because  $\theta$  is very small

$$Q = \sqrt{\frac{Mg}{Kl}} x^{3/2}$$

diff both wrt time

$$\frac{dQ}{dt} = \sqrt{\frac{Mg}{Kl}} \frac{3}{2} x^{1/2} \frac{dx}{dt} = \text{const}$$

$$\frac{dx}{dt} = \underbrace{\sqrt{\frac{Kl}{Mg}} \times \frac{2}{3}}_{\text{const}} x^{-1/2} \times \underbrace{\frac{dQ}{dt}}_{\text{const}}$$

$$\frac{dx}{dt} = \text{const} \times x^{-1/2} \Rightarrow \underline{\underline{v \propto x^{-1/2}}}$$