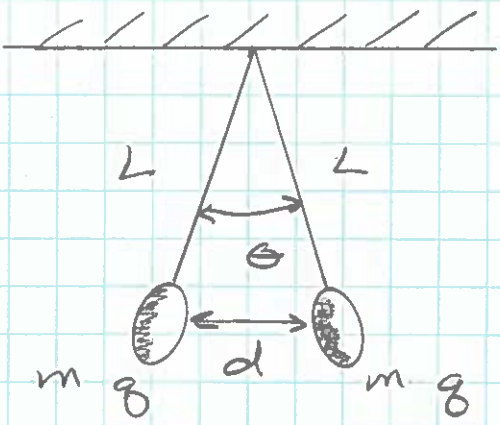


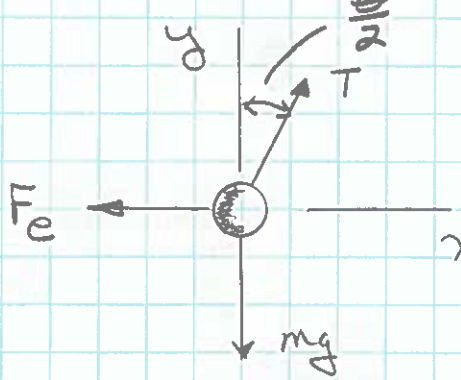
$L = 0.7\,m$

$m = 0.2\,g.$

$\theta = 20°$

Find charge q, assumed equal.

FBD of left balloon (right one given the same)



$$\Sigma F_y = T\cos\frac{\theta}{2} - mg = 0$$

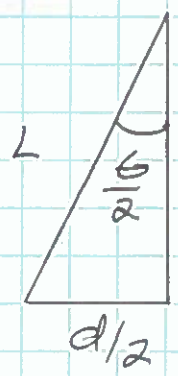
$$T = \frac{mg}{\cos\theta/2} \qquad (1)$$

$$\Sigma F_x = -F_e + T\sin\frac{\theta}{2} = 0 \qquad (2)$$

Now, from Coulomb's Law:

$$F_e = \frac{K|q||q|}{d^2} = \frac{Kq^2}{d^2}$$

and from geometry:



$$\sin\frac{\theta}{2} = \frac{d/2}{L}$$

So: $d = 2L\sin\frac{\theta}{2}$

and

$$F_e = \frac{Kq^2}{4L^2\sin^2\frac{\theta}{2}} \qquad (3)$$

Now, subst. equ'n (1) & (3) → equ'n (2):

$$-\frac{Kq^2}{4L^2\sin^2\frac{\theta}{2}} + \frac{mg}{\cos\frac{\theta}{2}}\sin\frac{\theta}{2} = 0$$

or,

$$\frac{-Kq^2}{4L^2\sin^2\frac{\theta}{2}} + mg\tan\frac{\theta}{2} = 0$$

and,

$$q^2 = \frac{4L^2\sin^2\frac{\theta}{2}}{K}\, mg\tan\frac{\theta}{2}$$

so

$$q = 2L\sin\frac{\theta}{2}\sqrt{\frac{mg}{K}\tan\frac{\theta}{2}}$$

$$= 4.77\times10^{-8}\,C$$

$$\underline{q = 47.7\ nC}$$