P #15

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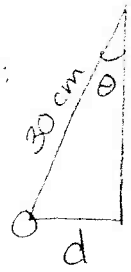
$m = .20\,g = .0002\,kg$
$\theta = 5.0°$

Find d:



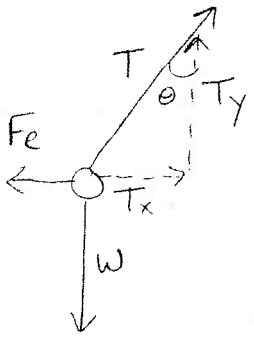
$\sin\theta = \frac{d}{30}$ so $d = (30\,cm)\cdot\sin 5°$

$d = 2.6\,cm$

Find r: $r = 2\cdot d$
$= 2(2.6\,cm)$

$r = 5.23\,cm = .0523\,m$

Find F_e



$T_y = W = m\cdot g$
$= (.0002\,kg)(9.8\,m/s^2)$
$T_y = .00196\,N$

By geometry: $\tan\theta = \frac{T_x}{T_y}$

so $\tan 5° = \frac{T_x}{(.00196N)}$

$F_e = T_x = 1.71\times10^{-4}\,N$

Find q:

$F_e = \frac{k_e\cdot q_1\cdot q_2}{r^2} = \frac{k_e\cdot q^2}{r^2}$

so $(1.71\times10^{-4}N) = \frac{(9.0\times10^9\,N\,m^2/C^2)(q^2)}{(.0523\,m)^2}$

$q = 7.22\times10^{-9}\,C$