PP|638

$q_1 = q$

$q_2 = q$

$r = 34\,cm$

$F_Q = 2.0 \times 10^{-2} N$

$$F_Q = \frac{kq_1q_2}{r^2}$$

$$F_Q = \frac{kq^2}{r^2}$$

$$q^2 = \frac{F_Q r^2}{k}$$

$$q^2 = \frac{(2.0\times10^{-2}N)(0.34m)^2}{(9.0\times10^9 N\cdot m^2/C^2)}$$

$$\boxed{q = 5.1\times10^{-7}C}$$

5.

$q_1 = +6.0\mu C \quad \times\frac{1}{3}$

$q_2 = -2.0\mu C \quad \times 1$

$r = d \quad \rightarrow \times 2$

$F_Q = 2.0N$

$$F_Q = \frac{kq_1q_2}{r^2}$$

$$d^2 = \frac{k(6.0\times10^{-6}C)(2.0\times10^{-6}C)}{2.0N}$$

$$d = 0.232379\,m$$

$$F_Q = \frac{k(2.0\times10^{-6}C)(2.0\times10^{-6}C)}{(2(0.232379m))^2}$$

$$\boxed{F_Q = 0.17N}$$

$$F_Q = \frac{kq_1q_2}{r^2}$$

$$F_Q' = \frac{k(\frac{1}{3}q_1)(q_2)}{(2r)^2}$$

$$F_Q' = \frac{1/3}{4}\frac{kq_1q_2}{r^2}$$

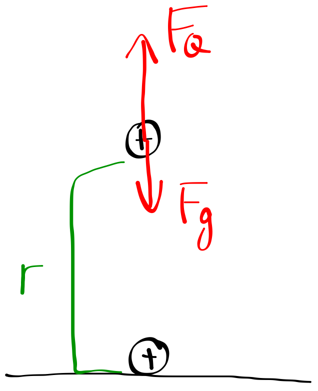
$$F_Q' = \frac{1}{12}\frac{kq_1q_2}{r^2}$$

$$F_Q' = \frac{1}{12}(2.0N)$$

$$F_Q' = 0.17N$$

PP|640

6.



$$F_Q = \frac{kq_1q_2}{r^2}$$

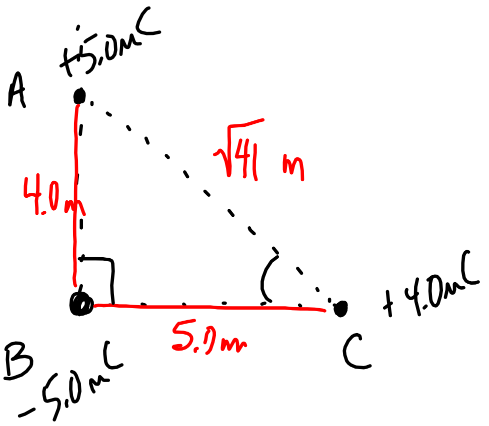
$$mg = \frac{kq^2}{r^2}$$

$$r^2 = \frac{kq^2}{mg}$$

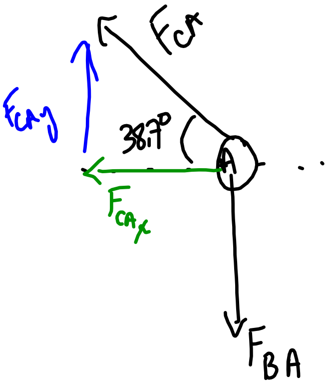
1.6×10^{-19} C

1.67×10^{-27} kg

7.



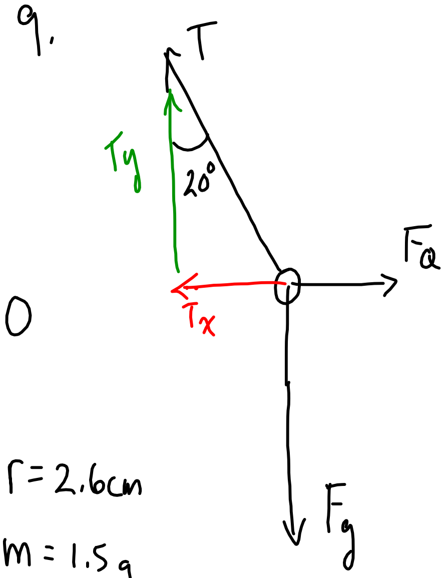
F_{net} on A:



	x	y
F_{BA}	0	− ?
F_{CA}	− ?	+ ?
F_{net}		

Coulomb's Law + Vectors (pp 640-641)

9.



r = 2.6cm

m = 1.5g

$q_1 = q_2 = q$

Vertically:

$$T_y = F_g$$

$$T_y = mg$$

$$T_y = (0.0015\,kg)(9.8\,m/s^2)$$

$$T_y = 0.014715\,N$$

$$\tan\theta = \frac{T_x}{T_y}$$

$$T_x = T_y \tan\theta$$

$$T_x = (0.014715N)(\tan 20^\circ)$$

$$T_x = 0.0053558\,N$$

Horizontally:

$$F_Q = T_x = 0.0053558\,N$$

$$F_Q = \frac{kq_1q_2}{r^2}$$

$$F_Q = \frac{kq^2}{r^2}$$

$$q^2 = \frac{F_Q r^2}{k}$$

$$q^2 = \frac{(0.0053558\,\cancel{N})(0.026\,\cancel{m})^2}{\left(9.0\times10^9\,\frac{\cancel{N}\cdot\cancel{m^2}}{C^2}\right)}$$

$$\boxed{q = 2.0\times10^{-8}\,C}$$

20 nC

this is the magnitude

$q = \pm\, 2.0\times10^{-8}\,C$

§ 14.2 Describing Fields

All the force vectors make up the field
↓
force per unit mass / charge

Electric Field Intensity / Strength

The electric field intensity at a point is the quotient of the electric force on a charge and the magnitude of the charge located at that point.

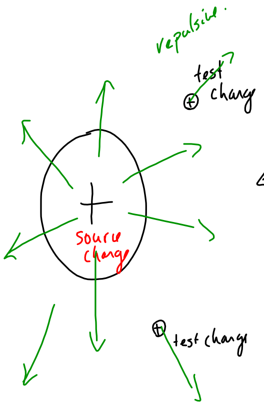
$$\vec{E} = \frac{\vec{F}_Q}{q}$$

Vector!

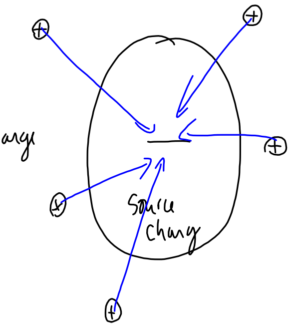
where $\vec{E}$ is the electric field intensity $\left(\frac{N}{C}\right)$

$\vec{F}_Q$ is the force acting on a positive test charge. (N)

q is the charge in the field (C)



← The field is radially outward for a positive source charge.



For a negative source charge the field is directed radially inward.

MP | 645

$q_t = +2.0 \times 10^{-9} C$

$\vec{F}_Q = 4.0 \times 10^{-9} N [W]$

a) $\vec{E} = ?$

b) if $q = +9.0 \times 10^{-6} C$, $\vec{F}_Q = ?$

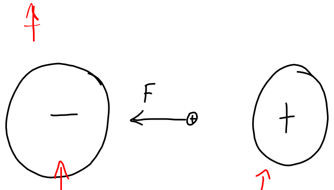
$$\vec{E} = \frac{\vec{F}}{q}$$

$$\vec{E} = \frac{4.0 \times 10^{-9} N [W]}{2.0 \times 10^{-9} C}$$

direction is OK as long as q is +

$$\boxed{\vec{E} = 2.0 \frac{N}{C} [W]}$$

We don't know what is causing the field, we only know that a + charge will experience a force to the West at this location.



this could create the field OR This could create the field.

b) $\vec{E} = \frac{\vec{F}_Q}{q}$

$\vec{F}_Q = q\vec{E}$

$\vec{F}_Q = (9.0 \times 10^{-6} C)(2.0 \frac{N}{C} [W])$

$\vec{F}_Q = 1.8 \times 10^{-5} N [W]$

If this is + then the dir is west.

Gravitational Field Intensity:

$$\vec{g} = \frac{\vec{F}_g}{m} \qquad \left(\vec{F}_g = m\vec{g} \right)$$

* vector (but will always be radially inward)

where $\vec{g}$ is the gravitational field intensity (N/kg)

$\vec{F}_g$ is the force of gravity (N)

m is the mass (kg)

Always attractive

PP/646-647 (electric field intensity)

MP/648 + PP/649 (gravitational field intensity).