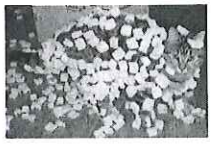
9/11/2017

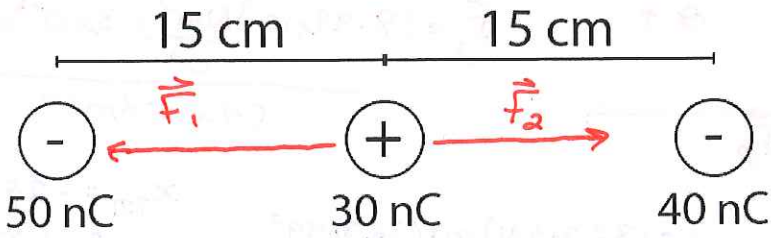


P30 Unit B: Electric Forces and Fields Practice

Name: Key!

Date: Feb 14th 2018

1. Calculate the *net electric force* on the center charge.



$\vec{F}_E = \frac{kq_1q_2}{r^2}$

$\vec{F}_1 = \frac{(8.99\times10^9 \frac{Nm^2}{C^2})(50\times10^{-9}C)(30\times10^{-9}C)}{(15\times10^{-2}m)^2}$

$\vec{F}_{21} = -5.9933\times10^{-4}N$

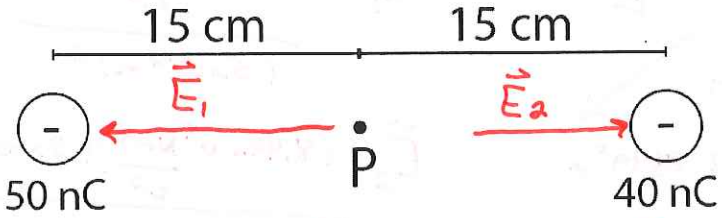
$\vec{F}_2 = \frac{(8.99\times10^9 \frac{Nm^2}{C^2})(30\times10^{-9}C)(40\times10^{-9}C)}{(15\times10^{-2}m)^2}$

$\vec{F}_2 = 4.7947\times10^{-4}N$

$\vec{F}_{net} = -5.9933\times10^{-4}N + 4.7947\times10^{-4}N$

$= \underline{-1.2\times10^{-4}N}$

2. Calculate the *net electric field* due to the charged objects at point P.



$\vec{E} = \frac{kq}{r^2}$

$\vec{E}_1 = \frac{(8.99\times10^9 \frac{Nm^2}{C^2})(50\times10^{-9}C)}{(15\times10^{-2}m)^2}$

$\vec{E}_1 = -19977.7778N/C$

$\vec{E}_2 = \frac{(8.99\times10^9 \frac{Nm^2}{C^2})(40\times10^{-9}C)}{(15\times10^{-2}m)^2}$

$\vec{E}_2 = 15982.2222N/C$

$\vec{E}_{net} = -19977.7778N/C + 15982.2222N/C$

$= \underline{-4.0\times10^3 N/C}$

3. Calculate the *net electric force* on the -3.0 μC charge.

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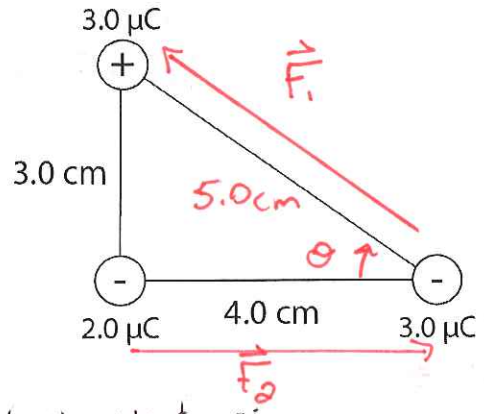


$\vec{F}_E = \frac{kq_1q_2}{r^2}$

$\vec{F}_1 = \frac{(8.99\times10^9\ Nm^2/C^2)(3\times10^{-6}C)^2}{(5\times10^{-2}m)^2}$

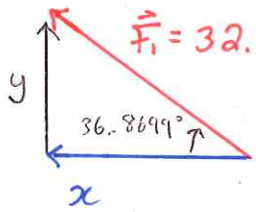
$\vec{F}_1 = 32.364\ N$

$\theta = \tan^{-1}\left(\frac{3cm}{4cm}\right)$

$\theta = 36.86°$

$\vec{F}_2 = \frac{(8.99\times10^9\ Nm^2/C^2)(3\times10^{-6}C)(2\times10^{-6}C)}{(4\times10^{-2}m)^2} = 33.7125N$

Add the Vectors:

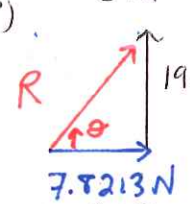


$x = (32.364N)\cos(36.8699°) = -25.9812N$

$y = (32.364N)\sin(36.8699°) = 19.4184N$

$x_{TOT} = -25.9812N + 33.7125N = 7.8213N$

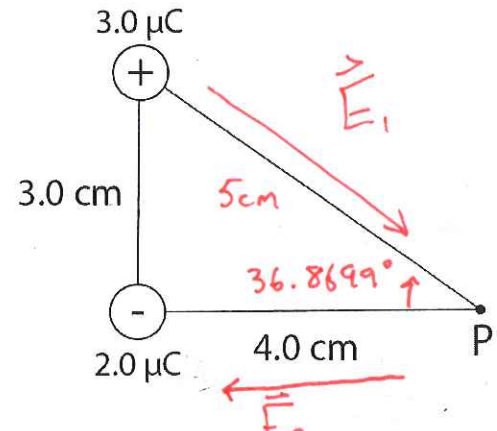
$y_{TOT} = 19.4184N$



$R = 20.9 = 21N$

$\theta = 68°$ N of E

4. Calculate the *net electric field* due to the charged objects at point P.

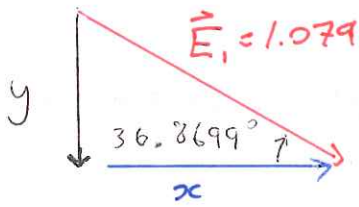


$\vec{E} = \frac{kq}{r^2}$

$\vec{E}_1 = \frac{(8.99\times10^9\ Nm^2/C^2)(3\times10^{-6}C)}{(5\times10^{-2}m)^2} = 1.079\times10^7\ N/C$

$\vec{E}_2 = \frac{(8.99\times10^9\ Nm^2/C^2)(2\times10^{-6}C)}{(4\times10^{-2}m)^2} = -1.124\times10^7\ N/C$

Add the Vectors:



$x = (1.079\times10^7 N/C)\cos(36.8699°)$

$x = 8631999.734\ N/C$

$y = (1.079\times10^7 N/C)\sin(36.8699°)$

$y = -6474000.355\ N/C$

$x_{TOT} = -1.124\times10^7\ N/C + 8631999.734\ N/C$

$= -2.608\times10^6\ N/C$

$y_{TOT} = -6474000.355\ N/C$

$R = 7.0\times10^6\ N/C$

$\theta = 22°$ W of S