220

$(+1\mu, 2, -8)$ $x = 3, y = 5$

$$\vec{r}_1 = 2\hat{x} - 8\hat{y}$$

$$\vec{r}_p = 3\hat{x} + 5\hat{y}$$

$$\vec{r}_{1p} = \vec{r}_p - \vec{r}_1 = (3-2)\hat{x} + (5-{-8})\hat{y}$$

$$= 1\hat{x} + 13\hat{y}$$

$$\vec{E}_p = \frac{kq}{r^2}\hat{r} = 8990 \frac{[1\hat{x} + 13\hat{y}]}{[1^2 + 13^2]^{3/2}}$$

$$\vec{E} = 4.05\hat{x} + 52.7\hat{y} \ \frac{N}{C}$$

$$|\vec{E}| = \sqrt{4.05^2 + 52.7^2} = 52.9 \ \frac{N}{C}$$

$$\vec{F} = q\vec{E} = 2\times10^{-6}(4.05\hat{x} + 52.7\hat{y})$$

$$= 8.1\times10^{-6}\hat{x} + 1.05\times10^{-4}\hat{y} \ N$$

220

(+1μ, 2, -8) x=3, y=5

$\vec{r}_1 = 2\hat{x} - 8\hat{y}$

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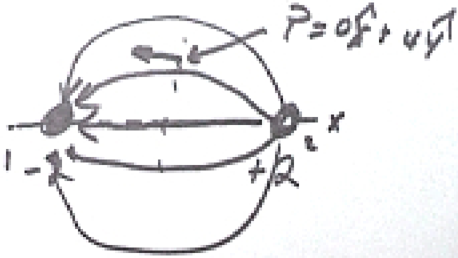
$\vec{F} = q\vec{E} = 2\times10^{-6}(4.05\hat{x} + 52.7\hat{y})$

$= 8.1\times10^{-6}\hat{x} + 1.05\times10^{-4}\hat{y}\ N$



$$\vec{r}_1 = -1\hat{x} + 0\hat{y}$$

$$\vec{r}_2 = 1\hat{x} + 0\hat{y}$$

$$\vec{r}_p = 0\hat{x} + 4\hat{y}$$

$$\vec{r}_{1p} = \vec{r}_p - \vec{r}_1 = 1\hat{x} + 4\hat{y}$$

$$\vec{r}_{2p} = \vec{r}_p - \vec{r}_2 = -1\hat{x} + 4\hat{y}$$

$$\vec{E} = 8990(2)\Big[(-)\frac{1\hat{x}+4\hat{y}}{[1^2+4^2]^{3/2}} + (+)\frac{-1\hat{x}+4\hat{y}}{[1^2+4^2]^{3/2}}\Big]$$

$$\vec{E} = 8990(2)\left[(-)\frac{1\hat{x}+4\hat{y}}{[1^2+4^2]^{3/2}} + (+)\frac{-1\hat{x}+4\hat{y}}{[1^2+4^2]^{3/2}}\right]$$

$$\vec{E} = -513\,\hat{x}\,\frac{N}{C}$$

$$\vec{p} = \sum q_i \vec{r}_i$$

$$= (-2\mu)(-1\hat{x}+0\hat{y}) + (2\mu)(1\hat{x}+0\hat{y})$$

$$= 4\times10^{-6}\,\hat{x}\ \text{Cm}$$

$$\ominus \xrightarrow[\vec{p}]{} \oplus$$

$$\rho = \frac{Q}{\frac{4}{3}\pi b^3}$$

GS, $r < b$

$\vec{E} \parallel \vec{A}$ $|\vec{E}|$ const

$$\Phi_E = \frac{Q_{enc}}{\varepsilon_0}$$

$$Q_{enc} = \rho \cdot \frac{4}{3}\pi r^3 = Q\left(\frac{r^3}{b^3}\right)$$

$$\Phi = E(4\pi r^2)$$

$$E(4\pi r^2) = \frac{Q}{\varepsilon_0}\left(\frac{r^3}{b^3}\right)$$

$$\vec{E} = \frac{Q}{4\pi}\frac{r}{b^3}\hat{r}$$ Inside

Out:

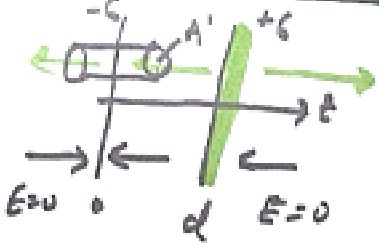
On GS:
$|\vec{E}|$ const
$\vec{E} \parallel \vec{A}$

$$\Phi_E = \frac{q_{enc}}{\varepsilon_0} \qquad q_{enc} = Q$$

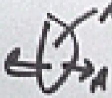
$$\Phi_E = E(4\pi r^2)$$

$$E(4\pi r^2) = \frac{Q}{\varepsilon_0}$$

$$\vec{E} = \frac{Q}{4\pi\varepsilon_0 r^2}\hat{r}$$



$$\Phi_E = \frac{Q_{enc}}{\varepsilon_0}$$



$$EA' = \frac{\sigma A'}{\varepsilon_0} \Rightarrow \vec{E} = \frac{\sigma}{\varepsilon_0}\hat{z}$$

$$\vec{E} = -\frac{\sigma}{\varepsilon_0}\hat{x}$$

$$\vec{E} = -\frac{2\times10^{-6}}{8.8\times10^{-12}} = -2.26\times10^{5}\,\frac{N}{C}\hat{z}$$