22
250

Electric field

$$\vec{F}_p = k \sum_{\substack{i=1 \\ i \neq p}}^{n} \frac{q_i q_p}{r_{ip}^2} \hat{r}_{ip}$$

$\vec{r}_i, \vec{r}_p, r_{ip}$

$$\vec{E}_p = \frac{\vec{F}_p}{q_p} \left[\frac{N}{C}\right]$$

$$\vec{E}_p = k \sum_{i=1}^{n} \frac{q_i}{r_{ip}^2} \hat{r}_{ip}$$

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

$k_e = 8990$

q (1μ; x=1, y=2)

$\vec{E}$ (x=4, y=3)

$\vec{r}_i = 1\hat{x} + 2\hat{y}$ . . .

$\vec{r}_p = 4\hat{x} + 3\hat{y}$ Σ

$\vec{r}_{ip} = \vec{r}_p - \vec{r}_i = (4-1)\hat{x} + (3-2)\hat{y}$

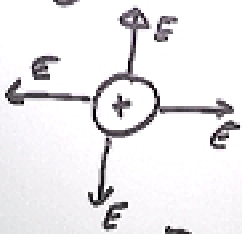
$= 3\hat{x} + 1\hat{y}$

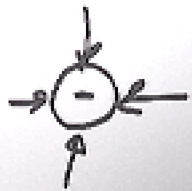
$|\vec{r}_{ip}| = \sqrt{3^2+1^2} = \sqrt{10} = 3.16$

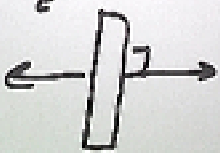
$\vec{E}_p = 8990\left[\frac{1}{10} \cdot \frac{3\hat{x}+1\hat{y}}{3.16}\right]$

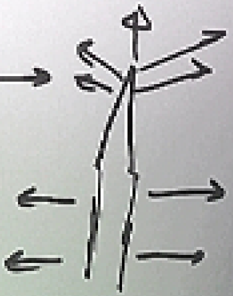
$= 899[0.95\hat{x}\ 0.316\hat{y}]$

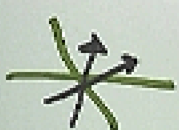
$= \overset{854}{\cancel{285}}\hat{x} + 284\hat{y}$ N/C







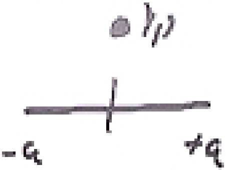




$\vec{E} = \sum \vec{E}_i$

$\propto E^2$

$\vec{r}_i$

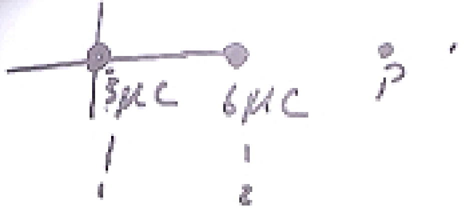


$\vec{r}_i = x_i \hat{x}$ $\qquad \lambda = \frac{Q}{L}$

$$\vec{E} = \int_{-a}^{+a} k \frac{q_i}{[x_i^2 + y_p^2]} \cdot \frac{(0 - x_i)\hat{x} + y_p \hat{y}}{\sqrt{x_i^2 + y_p^2}}$$

all q_i

$q_i = \lambda \, dx_i$



$$\vec{E}_p = k\sum_{i=1}^{2}\frac{q_i}{r_{ip}^2}\hat{r}_{ip}$$

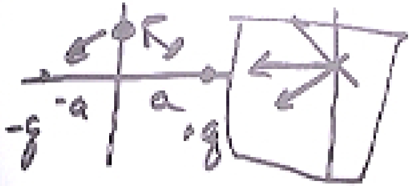
$$= k\mu\left[\frac{-3}{\left[(x_p-0)^2+0^2\right]^{3/2}}\left((x_p-0)\hat{x}\right)\right.$$

$$\left.+\frac{6}{\left[(x_p-1)^2\right]^{3/2}}\left(x_p-1\right)\hat{x}\right]$$

$$0=[\quad]\Rightarrow x_p$$

$$\hat{r}_{ip}=\frac{\vec{r}_{ip}}{|\vec{r}_{ip}|}=\frac{\vec{r}_{ip}}{[r_{ip}^2]\cdot[|r_{ip}|]}$$

$$=\frac{\vec{r}_{ip}}{[r_{ip}^{3/2}]}$$



$\bar{E}_p$: $\bar{r}_i : \bar{r}_1 , \bar{r}_2$

$\bar{r}_p$ $r_{ix} , \hat{r}_{iy}$

$\bar{r}_1 = a\hat{x} + 0\hat{y}$ $\bar{r}_2 = -a\hat{x} + 0\hat{y}$

$\bar{r}_p = 0\hat{x} + y_p\hat{y}$

$\bar{r}_{1p} = -a\hat{x} + y_p\hat{y}$

$\bar{r}_{2p} = +a\hat{x} + y_p\hat{y}$

$$\vec{E}_p = k\mu \left[\frac{-a\hat{x} + y_p\hat{y}}{\left[a^2 + y_p^2\right]^{3/2}} \right.$$

$$\left. (-1)\frac{a\hat{x} + y_p\hat{y}}{\left[a^2 + y_p^2\right]^{3/2}} \right]$$

$$\cancel{\vec{E}_p = k\mu \frac{2y_p}{\left[a^2 + y_p^2\right]^{3/2}}} \hat{y}$$

$$\vec{E}_p = k\mu \left[\frac{2a\hat{x}}{\left[a^2 + y_p^2\right]^{3/2}} \right]$$

$$\vec{E}_p = kM\left[\frac{-a\hat{x} + y_p\hat{y}}{[a^2+y_p^2]^{3/2}}\right.$$

$$\left.(-1)\frac{a\hat{x} + y_p\hat{y}}{[a^2+y_p^2]^{3/2}}\right]$$

$$\cancel{\vec{E}_p = kM \cdot \frac{2y_p}{[a^2+y_p^2]^{3/2}}}\ \hat{y}$$

$$\vec{E}_p = kM\left[\frac{2a\hat{x}}{[a^2+y_p^2]^{3/2}}\right]$$

as $y_p >> a$

$$\simeq \frac{2akM\hat{x}}{y_p^3} \qquad 2qMs\hat{x}$$

$$\vec{p}$$

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