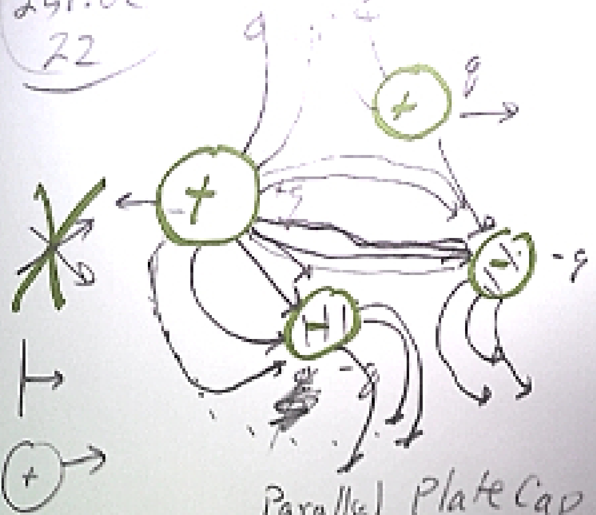
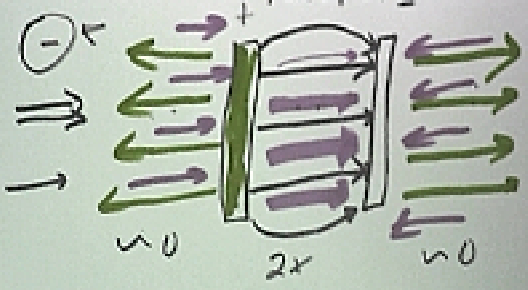
251.02
22



Parallel_Plate Cap



Q_i: $(2\mu; 5, 2)$

$q_i\,(x,y;\ x=5,\ y=2)$

$P: (1,1)$

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

$k\mu = 8990$

$\vec{r}_i$

$\vec{r}_p$

$\vec{r}_{ip}$

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

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

$\vec{E}$ @ P

$q: (2\mu; 5, 2)$ $\quad$ $P: (1,1)$

$q: (2M; 5,2) \quad P: (1,1)$

$\vec{r}_i = \vec{r}_1 = 5\hat{x} + 2\hat{y}$

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

$\vec{r}_{ip} = \vec{r}_p - \vec{r}_i = (1\hat{x} + 1\hat{y}) - (5\hat{x} + 2\hat{y})$

$= (1-5)\hat{x} + (1-2)\hat{y}$

$= -4\hat{x} - 1\hat{y}$

$\hat{r}_{ip} = \frac{\vec{r}_{ip}}{|\vec{r}_{ip}|}$

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

$$= -2kM\left[\frac{4\hat{x} + 1\hat{y}}{(16+1)^{3/2}}\right]$$

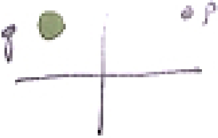
$$\vec{E}_p = \frac{-2.8990}{70.1}\left[4\hat{x} + 1\hat{y}\right]$$

$$\frac{1}{r_{ip}^2}$$

$$\frac{1}{\left(\sqrt{x_{ip}^2 + y_{ip}^2}\right)^2} \cdot \frac{\vec{r}_{ip}}{\sqrt{x_{ip}^2 + y_{ip}^2}} = \frac{\vec{r}_{ip}}{(r_{ip})^{3/2}}$$

$$\vec{E}_p = -1051\left(4\hat{x} + 1\hat{y}\right)$$

$$\vec{E}_p = -4205\hat{x} - 1051\hat{y}\ \frac{N}{C}$$



$q = (5\mu; -1, -1)$

$P = (2, 1)$

$\vec{E}_p$ $\qquad \vec{r}_1 = -1\hat{x} - 1\hat{y}$

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

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

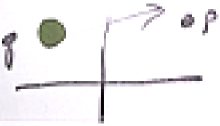
$$= 3\hat{x} + 2\hat{y}$$

$$\vec{E}_p = 5\mu k \left[\frac{3\hat{x} + 2\hat{y}}{(3^2 + 2^2)^{3/2}} \right]$$

$(3^2 + 2^2)^{3/2}$

$(9 + 4)^{3/2}$

46.9



$q = (5\mu; -1, -1)$

$$\vec{E}_p = \frac{5\times 8990}{46.9}\left(3\hat{x}+2\hat{y}\right)$$

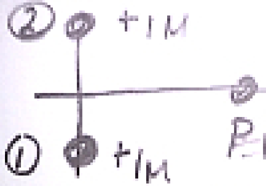
$$= 958\left(3\hat{x}+2\hat{y}\right)$$

$$= 2875\hat{x} + 1916\hat{y}\ \frac{N}{C}$$

$q_p = -3\mu$ | $\vec{E} = \frac{\vec{F}}{q}$

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

$$\Rightarrow F = -8625\hat{x} - 5748\hat{y}\ N$$



$q_1 : (1M; 0, -1)$

$q_2 : (1M; 0, +1)$

~~P(x=0,~~ y-

$P(x = x_p, y = 0)$

$\vec{E}_p$: sketch first

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

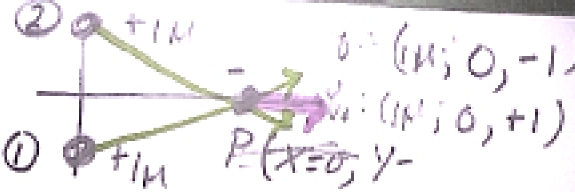
$\vec{r}_1, \vec{r}_2, \vec{r}_p, \vec{r}_{1p}, \vec{r}_{2p}$

$\vec{r}_1 = 0\hat{x} - 1\hat{y} \quad \vec{r}_2 = 0\hat{x} + 1\hat{y}$

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

$$\vec{r}_{1p} = \vec{r}_p - \vec{r}_1 = (x_p - 0)\hat{x} + (0 - {}^{-}1)\hat{y}$$
$$= x_p\hat{x} + 1\hat{y}$$

$$\vec{r}_{2p} = \vec{r}_p - \vec{r}_1 = x_p\hat{x} - 1\hat{y}$$



$P(x=x_p, y=0)$

$\vec{E}_p$: sketch first

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

$\vec{r}_1$, $\vec{r}_2$, $\vec{r}_p$, $\vec{r}_{1p}$, $\vec{r}_{2p}$

$\vec{r}_1 = 0\hat{x} - 1\hat{y}$ $\quad \vec{r}_2 = 0\hat{x} + 1\hat{y}$

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

$$\vec{r}_{1p} = \vec{r}_p - \vec{r}_1 = (x_p - 0)\hat{x} + (0 - {}^-1)\hat{y}$$
$$= x_p\hat{x} + 1\hat{y}$$

$$\vec{r}_{2p} = \vec{r}_p - \vec{r}_1 = x_p\hat{x} - 1\hat{y}$$

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

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

$$\vec{E} = \frac{k\mu \cdot 2x_p}{(x_p^2+1^2)^{3/2}}\hat{x} + 0\hat{y}$$

$$x_p \sim 0 \quad [\cancel{k}K \cdot x_p]$$

$$\underline{F = -Kx_p}$$

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

$$\vec{E} = \frac{-kM\cdot 2x_p}{(x_p^2+1^2)^{3/2}}\hat{x} + 0\hat{y}$$

$x_p \sim 0 \quad [\cancel{Q}K\cdot x_p]$

$$\boxed{\underline{F = -Kx_p}}$$