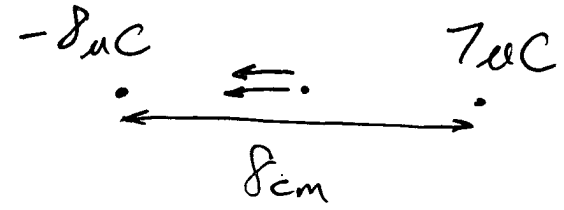
CH 16, P 28



$$E_{-8\mu C} = \left(9\times10^{9}\,\frac{N_m^2}{C^2}\right)\frac{(8\times10^{-6}C)}{(0.04m)^2} = 4.52\times10^{7}\,N/C \quad \text{LEFT}$$

$$E_{7\mu C} = \left(9\times10^{9}\,\frac{N_m^2}{C^2}\right)\frac{(7\times10^{-6}C)}{(0.04m)^2} = 3.9\times10^{7}\,N/C \quad \text{LEFT}$$

$E = 8.4\times10^{7}\,N/C$ TO THE LEFT

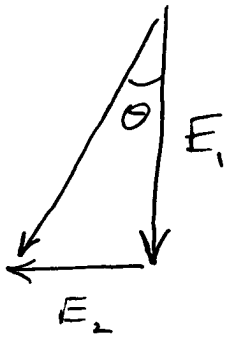
$Q_1 = 4\mu C$

$Q_2 = -8\mu C$

P

$$E_1 = \left(9\times10^9 \frac{N_m^2}{C^2}\right)\frac{(4\times10^{-6}C)}{(0.02m)^2} = 9\times10^7 N/C \quad \text{DOWNWARD}$$

$$E_2 = \left(9\times10^9 \frac{N_m^2}{C^2}\right)\frac{(8\times10^{-6}C)}{(0.04m)^2} = 4.5\times10^7 N/C \quad \text{LEFTWARD}$$



$$E = \sqrt{E_1^2 + E_2^2}$$

$$= 1.0\times10^8 N/C$$

$$\theta = \tan^{-1}\left(\frac{4.5}{9}\right) = 26.6^\circ$$

HOW COULD THIS BE HARDER?

$Q_1 = 4\mu C$

$Q_2 = -8\mu C$

P P_2

FIND $\vec{E}$ AT P_2.

19TH CENTURY VIEW OF ELECTRICITY

- CHARGE CREATES $\vec{E}$
- $\vec{E}$ EXERTS FORCE ON CHARGE

LORENTZ FORCE LAW

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

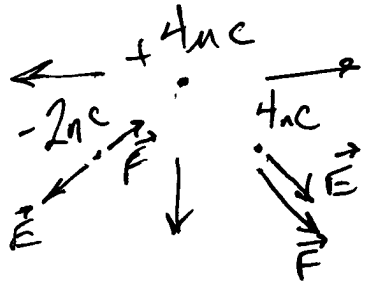
$\vec{F}$ = FORCE ON q

q = CHARGE OF A PARTICLE SITTING IN ELECTRIC FIELD $\vec{E}$

$\vec{E}$ = ELECTRIC FIELD PRODUCED BY OTHER CHARGES (NOT q)

IF $q > 0$, THEN $\vec{F}$ IS IN SAME DIRECTION AS $\vec{E}$.

IF $q < 0$, THEN $\vec{F}$ IS IN OPPOSITE DIRECTION FROM $\vec{E}$.



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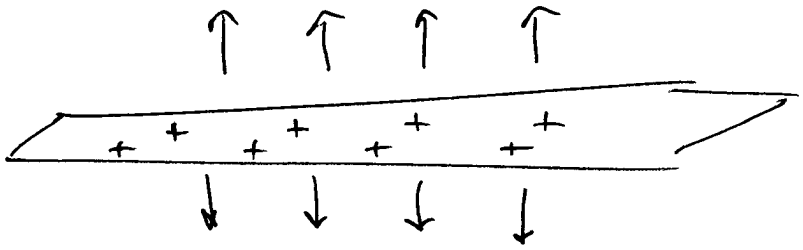
$$F = qE$$

$$(3.75 \times 10^{-14}\ N) = (1.602 \times 10^{-19}\ C)\,E$$

$$E = \frac{3.75 \times 10^{-14}\ N}{1.602 \times 10^{-19}\ C} = 2.3 \times 10^{5}\ N/C \quad \text{SOUTH}$$

ELECTRON WOULD FEEL $3.75 \times 10^{-14}\ N$ FORCE NORTH.



$$E = \frac{\sigma}{2\epsilon_0} = 2\pi k \sigma$$

$$= 2\pi \left(9 \times 10^9 \frac{N m^2}{C^2}\right)\left(0.004\ C/m^2\right)$$

$$= 2.3 \times 10^8\ N/C$$

ABOVE THE PLATE, $\vec{E}$ POINTS UPWARDS

BELOW THE PLATE, $\vec{E}$ POINTS DOWNWARD.