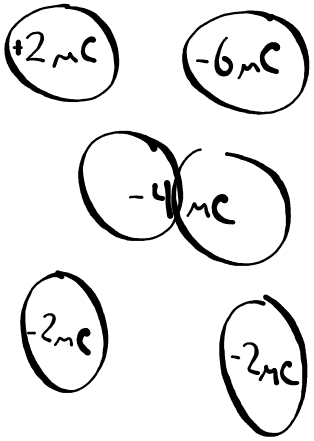
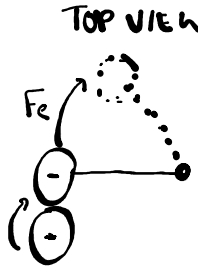
Part 2a - Coulomb's Law, Electric Fields, and Parallel Plates

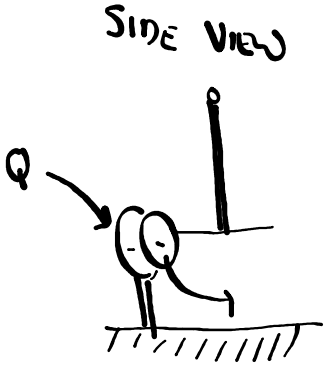
① Cons. of Charge



② Torsion Experiment



Develop $1/r^2$ relationship.



(3) Electrostatic Attraction/Repulsion

$$F_e = \frac{kq_1q_2}{r^2}$$

Double q_1 and triple r

$$F_{new} = \frac{k(2q_1)q_2}{(3r)^2} = \frac{2kq_1q_2}{9r^2} = \frac{2}{9}F_{original}$$

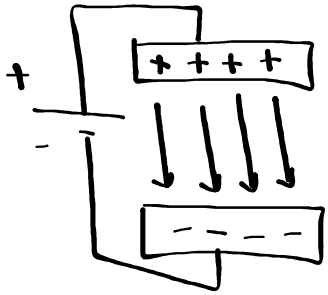
(4) Linearizing Graphs

$y = mx + b$

$F_e = (kq_1q_2)\frac{1}{r^2} + 0$

$Slope = kq_1q_2$

5 Electric fields of Point Charges + Parallel Plates



Uniform strength/direction Electric Field.

Point Charges (have $1/r^2$)

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

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

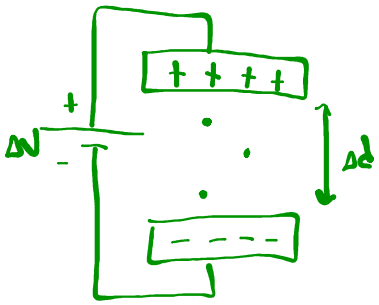
Both!

$$|\vec{E}| = \frac{\vec{F}_e}{q}$$

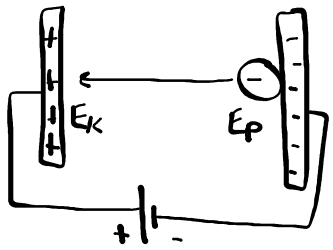
$$\Delta V = \frac{\Delta E_p}{q}$$

Parallel Plates (have ΔV)

$$|\vec{E}| = \frac{\Delta V}{\Delta d}$$



⑥ Cons. of E



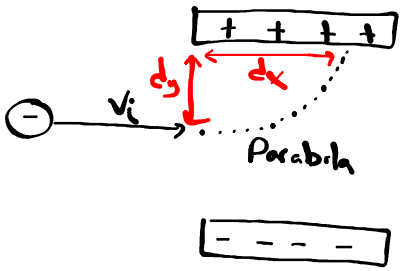
$\Delta V = \frac{\Delta E_P}{q} \rightarrow \Delta E_P = q\Delta V$

$E_K = \frac{1}{2}mv^2$

$E_P \rightarrow E_K$

$q\Delta V \rightarrow \frac{1}{2}mv^2$

⑦ Projectile Motion



Ⓐ $\vec{E} = ?$

$|\vec{E}| = \frac{\Delta V}{\Delta d}$ ← Plate separation distance

Ⓑ $\vec{F} = ?$

$\vec{E} = \frac{\vec{F_e}}{q}$ or $\vec{F_e} = q\vec{E}$

Ⓒ $a = \frac{F_{net}}{m}$ to find $\vec{a}$

x-comp → Uniform motion

v_i = given (and does not change)

$t = ?$

d_x = given or solve for

$v = \frac{d}{t}$

y-comp → Accel motion

$v_i = 0$

a = calculated in step C.

$t = ?$

d_y = given or solve for

$d = v_i t + \frac{1}{2}at^2$ ($v_i = 0$)

$d = \frac{1}{2}at^2$

Part 2b - Magnetic Forces + Fields, Motor + Generator Effect, Millikan