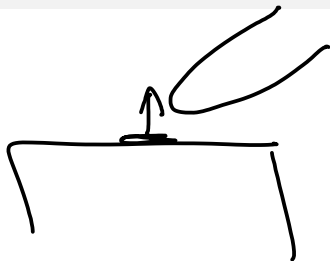
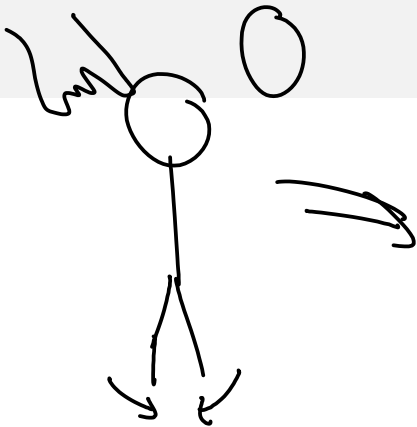
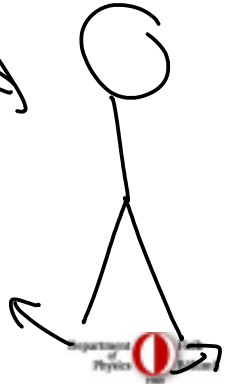
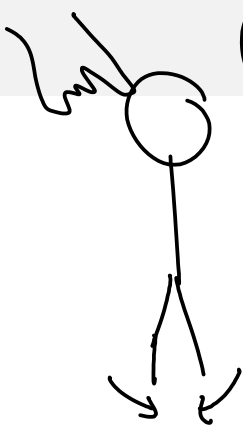


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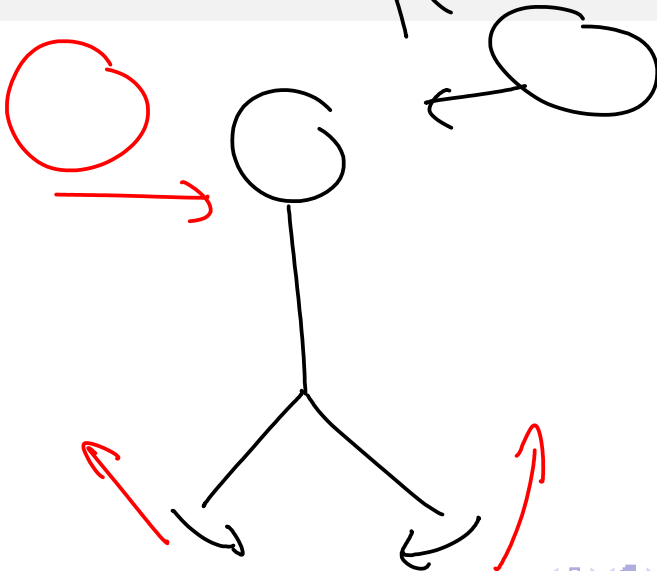






remove ball

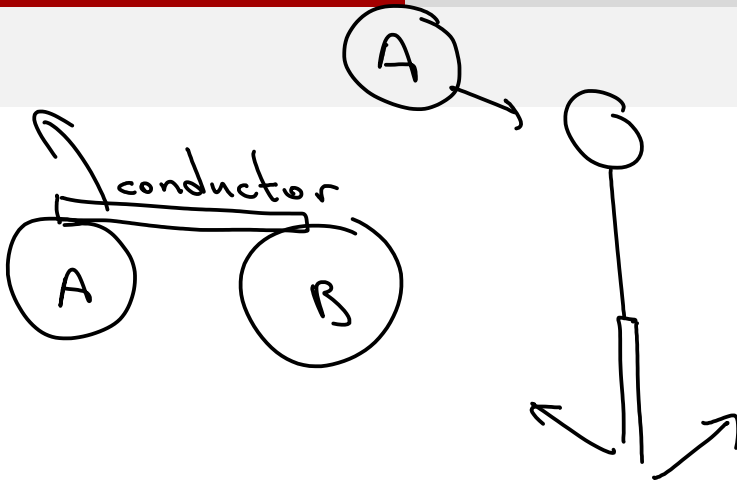
electroscope

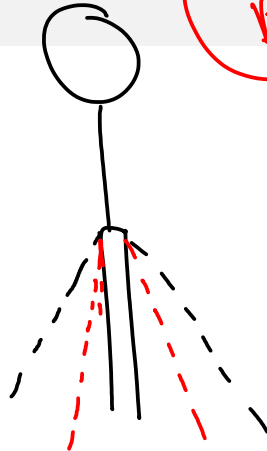


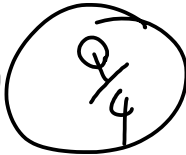
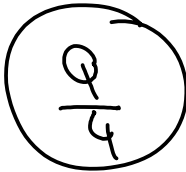
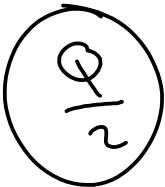
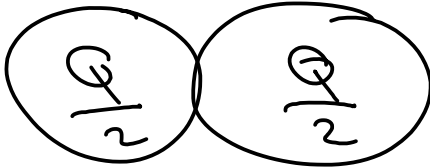
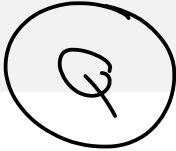
- conductors.

- insulators

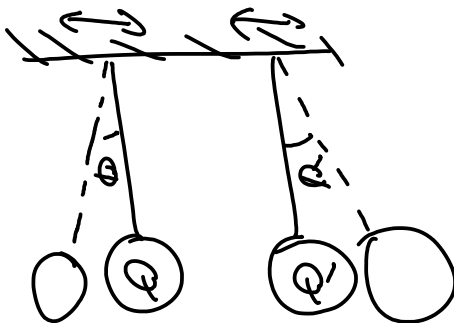
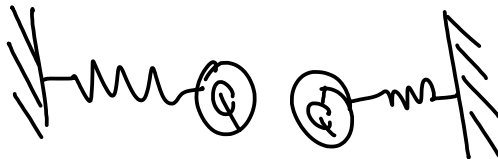
- to charge





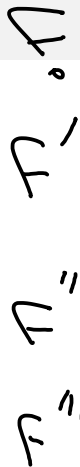
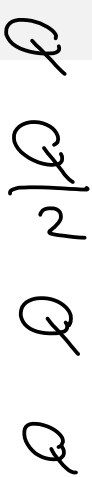


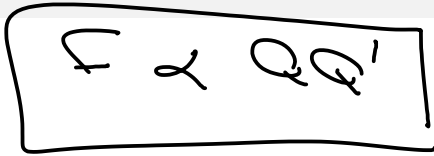
...



$\theta, \theta' \rightarrow T$

constant distance





$$F \propto \frac{Q Q_-}{d^2}$$

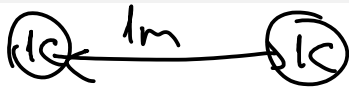
$$n = 2 \pm (1 \times 10^{-16})$$

$$F \propto \frac{Q Q'}{r^2} \quad 1 \text{ Coulomb} = 1 \text{ C}$$

$$F = k \frac{Q Q'}{r^2}$$

$$k = \frac{1}{4\pi\epsilon_0} = 8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$$





$$F = \left(8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2} \right) \frac{(1\text{C})^2}{(1\text{m})^2}$$

$$= 8.99 \times 10^9 \text{ N}$$

$$1 \mu\text{C} = 10^{-6} \text{ C}$$

$\frac{E_x}{}$

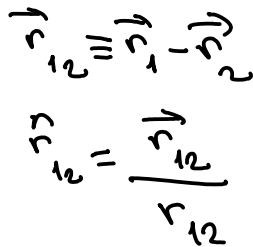
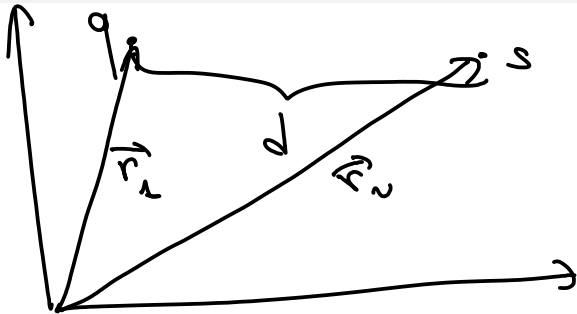


$$q = ?$$

$$m = 10^{-2} \text{ gm}$$

$$10^{-4} \text{ N} = (8.99 \times 10^9) \frac{q^2}{r^2} \Rightarrow q = 10^{-4} \mu\text{C}$$



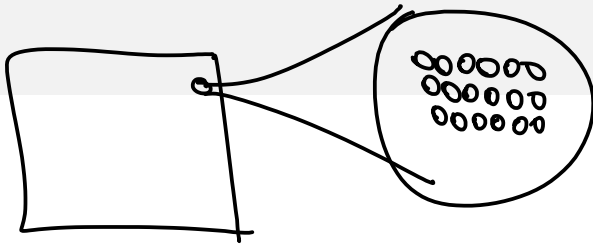


$$F_{12} = k q s \frac{\vec{r}_{12}}{r_{12}^3} = k q s \frac{\vec{r}_{12}}{r_{12}^2}$$

$$= -k q s \frac{\vec{r}_{21}}{r_{21}^2} = -F_{21}$$



$$k q_s \frac{r_{12}^2}{r_{12}^3} = k q_s \frac{r_{12}^2}{r_{12}^2} \left(\frac{r_{12}^2}{r_{12}^2} \right)$$



atoms = electrons + nucleus

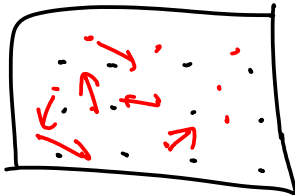
nucleus = protons + neutrons

electron's charge = $-e = -1.6 \times 10^{-19} \text{ C}$

proton's charge = $+e$

$$\text{charge of an object} = (\# \text{ protons} - \# \text{ electrons}) \times e$$

conductors



- : copper atoms (eg)
- : electrons

