1> Coulomb's Law :-

$$f = \left(\frac{1}{4\pi\varepsilon_0}\right)\left(\frac{q_1 q_2}{r^2}\right)$$

2> Surface charge :-

$$\text{density } \sigma = \frac{q}{A}$$

$$\text{for sphere, } \sigma = \frac{q}{4\pi r^2}$$

3> Electric intensity :-

$$E = \left(\frac{1}{4\pi\varepsilon_0}\right)\left(\frac{q}{r^2}\right)$$

4> Electric potential :-

$$E = \left(\frac{1}{4\pi\varepsilon_0}\right)\left(\frac{q}{r}\right)$$

5> Capacity of capcitor :-

$$C = \frac{\theta}{V}$$

6> capacity of Parallel plate capacitor

$$C = \frac{A\varepsilon_0 K}{d}$$

7> Electric dipole moment

$$\ell = (q)(d)$$

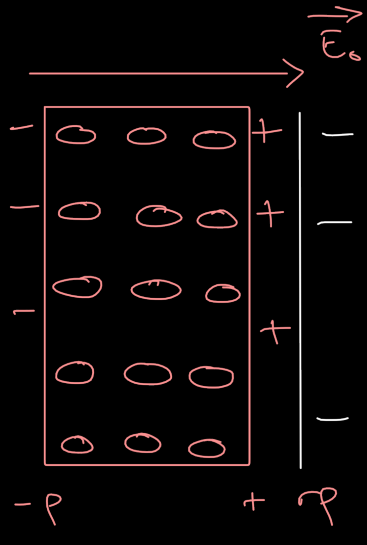
- Dielectric constant (K) or relative Permitivity (ε_r)

$$K \text{ or } \varepsilon_r = \frac{E_{air}}{E_{medium}} = \frac{V_{air}}{V_{medium}}$$

$$K \text{ or } \varepsilon_r = \frac{C_{medium}}{C_{air}}$$

It has no unit

Surface or induced charge density :-



$$E_0 = \frac{\sigma}{\varepsilon_0} \longrightarrow (1)$$

$$E = \frac{\sigma_p}{\varepsilon_0} \longrightarrow (2)$$

$$E_{net} = E_0 - E$$

$$\frac{\sigma}{\varepsilon_0 K} = \frac{\sigma}{\varepsilon_0} - \frac{\sigma_p}{\varepsilon_0}$$

$$\frac{\sigma}{\cancel{\varepsilon_0 K}} = \frac{\sigma - \sigma_p}{\cancel{\varepsilon_0}}$$

$$\frac{\sigma}{K} = \sigma - \sigma_p$$

$$\sigma_p = \sigma - \frac{\sigma}{K}$$

$$\boxed{\sigma_p = \sigma\left(1 - \frac{1}{K}\right)}$$

Polarization :-

$$P = \frac{q}{\text{Volume}} = \frac{(q_n)(\cancel{d})}{(A)(\cancel{d})}$$

$$\boxed{P = \sigma_p}$$

also, $P \propto E$

$$P = \chi \varepsilon_0 E$$

↑ Susceptibility