ELECTRIC CHARGE

Charge of a material body or particle is the property (acquired or natural) due to which it produces and experiences electrical and magnetic effects. Some of naturally occurring charged particles are electrons, protons, -particles etc.

Charge is a derived physical quantity & is measured in Coulomb in S.. unit. In practice we use mC(10^{-3}C), C (10^{-6}C), nC(10^{-9}C) etc.
C.G.S. unit of charge = electrostatic unit = esu. 1 coulomb = 3 × 109 esu of charge
Dimensional formula of charge = $[M^0L^0T^1I^1]$

COULOMB'S LAW

$$\text{i.e. } F \propto q_1q_2 \text{ and } \quad F \propto \frac{1}{r^2} \quad \Rightarrow F \propto \frac{q_1q_2}{r^2} \quad \Rightarrow \quad F = \frac{Kq_1q_2}{r^2}$$

Relative permittivity : $\varepsilon/\varepsilon_r = \varepsilon_0$

$$F = \frac{1}{4\pi\varepsilon_0\varepsilon_r}\frac{q_1q_2}{|\vec{r}|^3}\vec{r} = \frac{1}{4\pi\varepsilon_0\varepsilon_r}\frac{q_1q_2}{|\vec{r}|^2}\hat{r}$$