CONCEPT MAP

Electrostatics

erposition Principle : The tor sum of forces that would eus the total force.

Electric Charges

Study of electric charges at rest.

Electric Field : Electric field intensity at a point distant r from a point charge q in air is

$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}\hat{r}$$

Electric Flux : Electric flux over an area in an electric field represents the total number of electric field lines crossing this area.

nductors & Insulators : The terials which possess a large nber of free charge carriers creas insulators or dielectrics sess a negligibly small number ree charge carriers.

Conservation : Total charge of an isolated system remains unchanged with time.

Coulomb's Law:

$$\vec{F}_{21} = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^3}\vec{r}_{12}$$

i.e., charges are like charges

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Electric Dipole : Every dipole is associated with a dipole moment $\vec{p}$ whose magnitude is equal to the product of the magnitude of either charge (q) and the distance $2\vec{a}$ between the charges, *i.e.*,

$$\vec{p} = q \times (2\vec{a})$$

Gauss's Theorem : Total normal electric flux over a closed surface S in vacuum is $1/\varepsilon_0$ time the charge (Q) contained inside the surface

$$\phi_E = \oint_S \vec{E}\cdot d\vec{s} = \frac{Q}{\varepsilon_0}$$

Dielectrics

Capacitor : Conductor which store electric charge.

Electric Potential : The total amount of work done in bringing the various charges to their respective positions from infinitely large mutual separations.

Equipotential Surface : An equipotential surface is that at every point of which electric potential is the same. Equipotential surfaces are always perpendicular to the field lines.

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Non Polar

Capacitance

$$C' = \frac{\varepsilon_0 A}{d-t}$$ (conducting slab)

$$C'' = \frac{\varepsilon_0 A}{d - t\left(1 - \frac{1}{K}\right)}$$ (dielectric slab)

Parallel plate capacitor

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

Energy stored in a capacitor

$$U = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}QV$$

ctric polarization

$P = NP = Nqx$

Capacitors in parallel

$$C_P = \sum_{i=1}^{i=n} C_i$$

Van de Graaff generator: A Van de Graaff generator is a device used for building up high potential difference of the order of few million volts.

Potential Difference : Electrostatic potential difference between two points B and A in an electrostatic field is the amount of work done in carrying unit positive test charge from A to B (against the electrostatic force of the field) along any path between the two points, *i.e.*,

$$V_B - V_A = \frac{W_{AB}}{q_0} = -\int_A^B \vec{E}\cdot d\vec{l}$$

Capacitors in series

$$\frac{1}{C_S} = \sum_{i=1}^{i=n}\frac{1}{C_i}$$