ELECTROSTATIC POTENTIAL AND CAPACITANCE

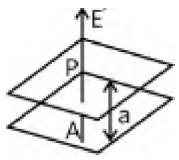
(111. El6ctric porterdial

{a) Potential clue to a conducting sphere of radius r With (-barge q (SOIICI Or hollow) at a distance r from the centre

$V = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{q}{r}$ if (r > R) or $V = \frac{q}{4\pi\varepsilon_0 R}$ if {r ■ It)

$V = \frac{1}{4}R$ if (r < R)

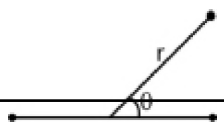
01 Relation between electric field potential I $|C| = \text{Pill}$



{2 ll. Electric. dipole poterrtFaI

{a) V = $\frac{1}{4\pi\varepsilon_a}\frac{p\cos 0}{r^2}$

(E4 Potential erbergy of a dipole in an external electric field



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(3). Capacitors

Capacitance of a potential plate capacitor $C = 6_{\ell}^{A}$

[4k. Electric field energy : (a) $U = \frac{1}{2}QV = \frac{Q^2}{2C} = \frac{1}{2}CV^2$

(b) Energy density of energy stored in electric held $U = \frac{1}{}c_a f^2$

(5) Combination of capacitors

(a) Wen capacitors are combined in series, $\frac{1}{C_{E\cdots}} = \frac{1}{C_1}\ \frac{1}{C_2}\ \frac{1}{C_3}$

(bli When capacitors are connected In parallel. $C_{ei} = C_{11}\ f_2 + C_3 +$

{cl1 C4IPWitanre Of spherical capacitor,

$C = 41rx \frac{a\,la}{_D\,b -}$ (When outer shell is earthed or

$C = 4\pi\varepsilon_0 \frac{b^2}{b-a}$. When Inner shell Is earthed} or

C = 47..E_{cl}R (Far a 5pnere of radius FL)

{dp Cylindrical capacitor, $C \frac{2\pi\varepsilon_0 \ell}{\ln\left(\frac{b}{a}\right)}$

(5). Dielectrics

(a) Induced charge, $q' = 411\text{--}$ (b) Polarization $p = \frac{\text{Dipole moment}}{\text{Volume}}$

Electric dipole moment Is p = X $_c$.t

$\frac{e}{L_{So}} = K - 1$ where rt $_e$ is electrical susceptibility,. and K is dielectric constant.