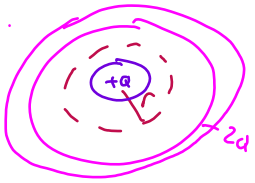
IV. Gauss & Equilibrium

(A) $\oint E \cdot dA = \frac{q_{in}}{\epsilon_0}$

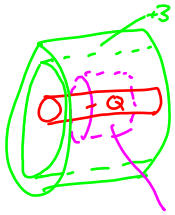
1. concentric spheres/shells
2. coaxial
3. sheet

$\oint dA = 4\pi r^2$

1.



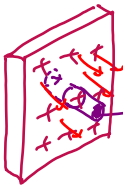
2.



$\oint dA = 2\pi r \ell$

$q_{in} = \lambda \ell$

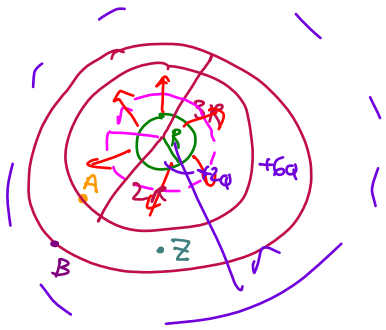
Gaussian surface



(B) $\Delta V = \frac{\Delta U}{q_0} = -\int E \cdot dr$

(C) Charge on each surface

Ex] Conducting sphere w/ R & +2Q, concentric metal shell w/ 2R, 3R & +6Q.



$\oint E \cdot dA = \frac{q_{in}}{\epsilon_0}$

$E(4\pi r^2) = \frac{2Q}{\epsilon_0}$

$E = \frac{1}{4\pi\epsilon_0}\frac{2Q}{r^2} = \frac{k2Q}{r^2}$

$E \cdot (4\pi r^2) = \frac{8Q}{\epsilon_0}$

$E_z = 0$

Q on A $\Rightarrow$ $-2Q$

Q on B $\Rightarrow$ $+8Q$

$\Big\}\ Q_{TOT} = +6Q$ on shell

V. Charge Distribution

(A) $E = k\int \frac{dq}{r^2}$

(B) $V = k\int \frac{dq}{r}$

(C) $\Delta V = -\int E \cdot dr$

(D) λ, σ, ρ

1. 

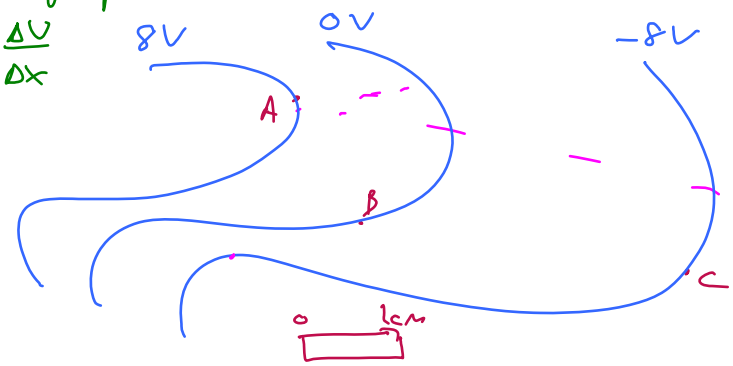
2. 

VI. Equipotential Map

(A) $\Delta V = \frac{\Delta U}{q}$

(B) $E \perp$ equipotentials (directions)

(C) $E = -\frac{\Delta V}{\Delta x}$



Ex)

$E = \left|\frac{\Delta V}{\Delta x}\right|$

$= \frac{16}{4} = 4$

$\Delta V = \frac{\Delta U}{q}$

$\Delta V q = \Delta U = \Delta K$