
Physics Mega Revision
#1
Electro, Current,
Capacitor
Superfast Revision
Welcome Students

Complete Physics Mega Revision Timetable

15 Feb
- Electrostatics
- Current electricity
- Capacitor
- 🎁 Surprise Gift 🎁

16 Feb
- Calorimetry
- Elasticity
- Thermal Expansion
- Heat Transfer
- KTG
- Thermodynamics
- Fluid Mechanics

17 Feb
- Magnetic effect of current
- Manetism and matter
- Emi
- AC

18 Feb
- UD
- Vector
- Kinematics 1D
- Kinematics 2D
- NLM
- Friction
- Circular motion
- Work power energy
- COM
- Rotation motion

19 Feb
- Ray optics
- Optical Instruments
- Wave optics
- EM Waves
- Errors in measurement

20 Feb
- Gravitation
- SHM
- Wave on string
- Sound wave

21 Feb
- Dual nature of radiation
- X-rays
- Nuclear physics
- Radioactivity
- Semi conductor
- Communication system

PHYSICS WAHI jo Deewana BANA DE

Faculty of the Series

Saranshu Gupta Sir

eSaral Physics HoD

- **IIT Bombay**, CS
- **AIR-41** IIT-JEE
- **Air-71** AIEEE (JEE Main)
- **AIR-4** NSO
- **1%** In Top INPHO
- **8+** Years of Teaching Experience
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Prateek Gupta Sir

eSaral Chemistry Faculty

- **IIT Bombay,** Metallurgy
- **Online** Creativity & Visualization Expert
- **Mentored** Lakhs of Students

Master Planners & Faculties

N.K. Gupta Sir

eSaral Math Faculty & Master Planner

- **IIT Kanpur**, Mechanical
- Ex **Vice President & Academic Head**, Allen, Kota
- Mentored many of **Rank 1** & **Top 100** Students
- **30+ years** of Teaching Experience
- **Mentored** over 3,00,000 Students

Master Planners & Faculties

Dr. Anshuman Agarwal

eSaral Biology Faculty

- **MBBS, MD, FIPM**
- **AIR-196**, AIPMT(NEET)
- **ARR-46**, RPMT
- **NTSE Scholar**
- **Ex HoD Biology**, Resonance, Kota
- **10+ years** of Teaching Experience
- **Mentored** over thousands of doctors

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Dr. Kushika Taneja

eSaral Biology Faculty

- **Ex-HoD Biology,** Pace IIT and Medical, Indore
- Biology faculty at Rao Academy, Kota
- **7+ years** of Teaching Experience
- **Mentored** over thousands of doctors

Electrostatics

Superfast Revision

Charge is Quantized

Its minimum value is $e = 1.6 \times 10^{-19}$ C

Coulomb's Law

$$F = \frac{1}{4\pi \epsilon_0} \times \frac{q_1 q_2}{r^2}$$

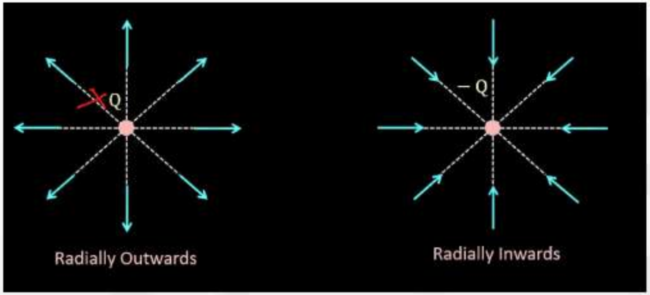
$$\epsilon_0 = 8.85 \times 10^{-12} \frac{C^2}{N - m^2}$$

Coulomb's Law in Vector form

$$\vec{F}_{21} = \frac{1}{4\pi \epsilon_0} \frac{q_1 q_2}{r_{21}^2} \hat{r}_{21}$$

Electric Field due to point charge

$$E = \frac{kQ}{r^2}$$



EFI due to system of point charges

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$$

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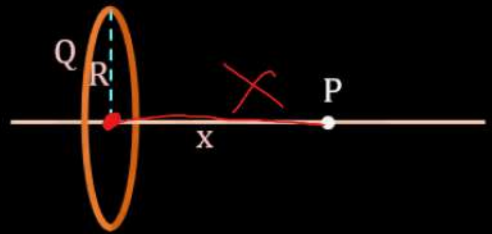
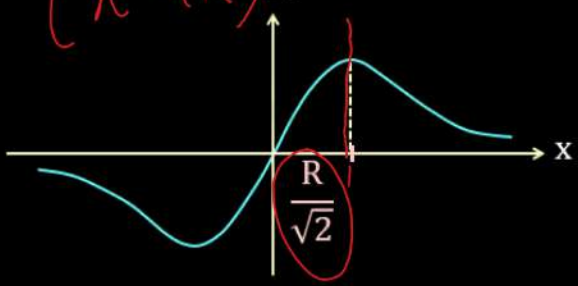
TRICK

EFI on the axis of uniformly charged ring



$$E = \frac{k\,Q\,x}{(x^2 + R^2)^{\frac{3}{2}}}$$

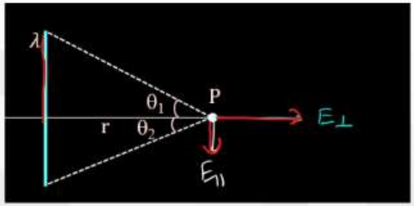
EFI at centre is zero.



EFI due to uniformly charged thin straight wire

$$E_{\perp} = \frac{k\lambda}{r}(\sin\theta_1 + \sin\theta_2)$$

$$E_{||} = \frac{k\lambda}{r}(\cos\theta_1 - \cos\theta_2)$$



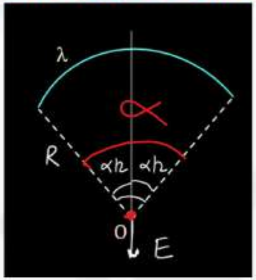
EFI due to uniformly charged semi infinite long wire

$$E_{\perp} = \frac{k\lambda}{r} \qquad E_{||} = \frac{k\lambda}{r}$$

EFI due to uniformly charged infinite long wire

$$E_{\perp} = \frac{2k\lambda}{r} \qquad E_{||} = 0$$

EFI due to uniformly charged arc at centre of curvature



$$E = \frac{2k\lambda}{R}\sin\left(\frac{\alpha}{2}\right)$$

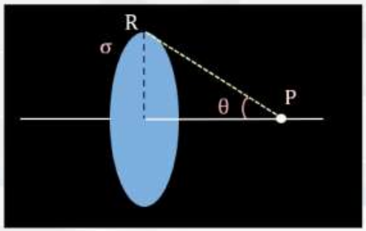
TRICK

$\alpha = 360^\circ$

0

$E = 0$

EFI on axis of uniformly charged disc



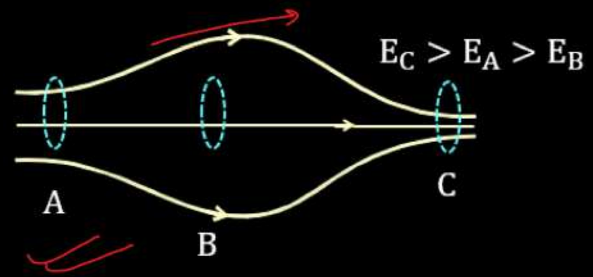
TRICK

$$E = \frac{\sigma}{2\epsilon_0}[1 - \cos\theta]$$

$\theta = 90^\circ$

$\frac{\sigma}{2\epsilon_0}$

Two field lines can never intersect each other.

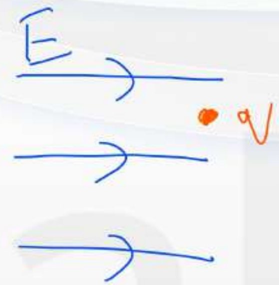


Number of field lines originating or terminating at a charge is proportional to the magnitude of the charge.

Magnitude of EFI at any point is directly proportional to the number of field lines crossing unit cross - sectional area (Density of field lines) at that point.

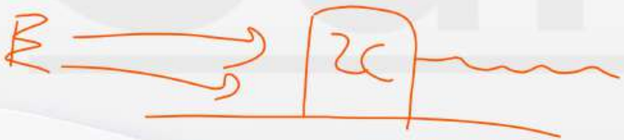
Electrostatic field lines can never form a closed loop because electrostatic force is conservative in nature (but induced electric field always form a closed loop).

$$\vec{F} = q\vec{E}$$

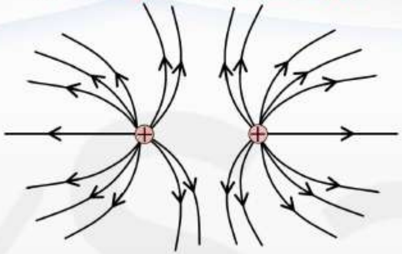


If q is + ve then $\vec{F}$ in the direction of $\vec{E}$

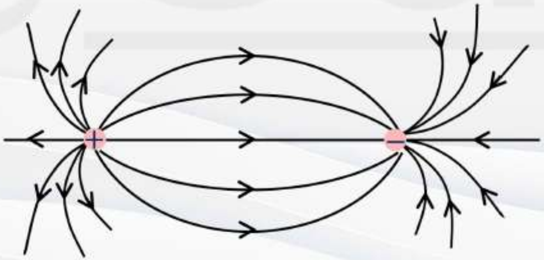
If q is – ve then $\vec{F}$ in direction opposite to $\vec{E}$



Electric field lines due to two positive charges



Electric field lines due to One positive and one negative charge



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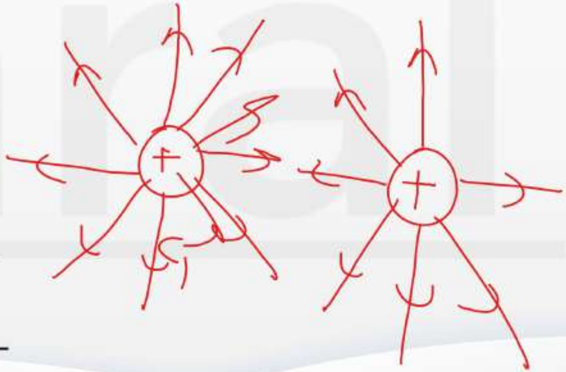
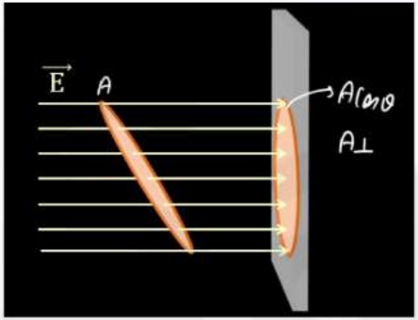
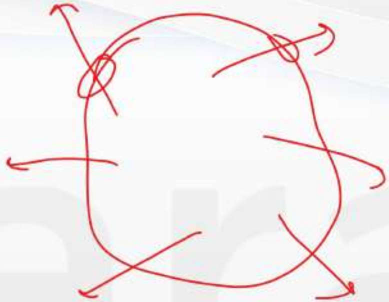


Electric Flux

$\phi = \vec{E} \cdot \vec{A}$ $\phi = E\,A\cos\theta = E\,A_{\perp}$



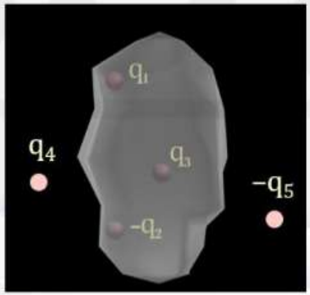


Net flux linked with closed Surface is-

$$\phi = \oint \vec{E} \cdot d\vec{A}$$

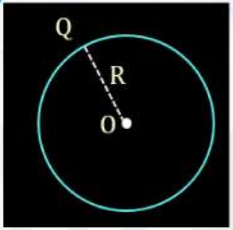
Gauss Law

$$\oint \vec{E}.\overrightarrow{dA} = \frac{\sum q_{inside}}{\epsilon_0}$$



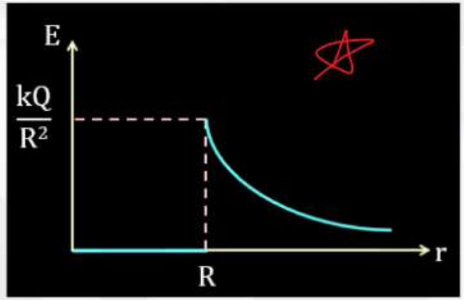
$\vec{E}$ = **Net EFI due to all charges (both inside and outside the closed surface)**

EFI due to uniformly charged thin spherical shell



$r < R, \quad E = 0$

$r > R, \quad E = \dfrac{kQ}{r^2}$



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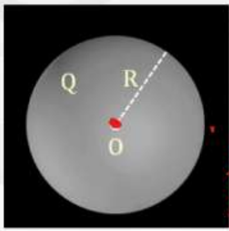
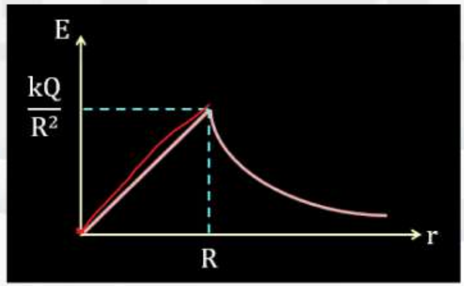
EFI due to uniformly charged solid sphere

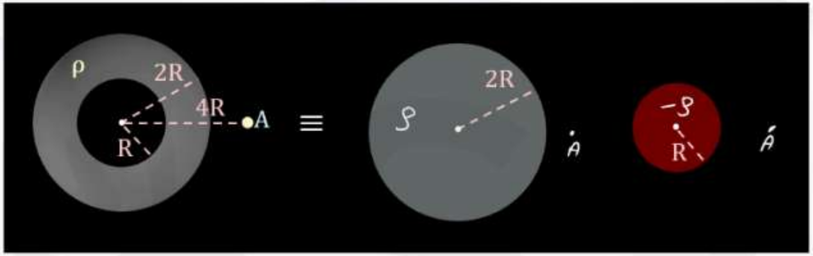


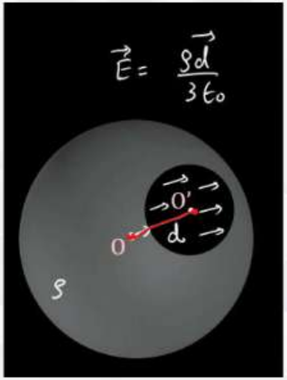
$r < R, \quad E = \dfrac{\rho r}{3 \epsilon_0}$

$r = R \quad E = \dfrac{\rho R}{3 \epsilon_0}$

$r > R \quad E = \dfrac{kQ}{r^2}$





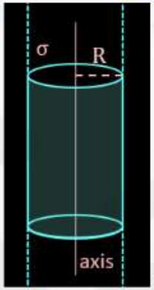


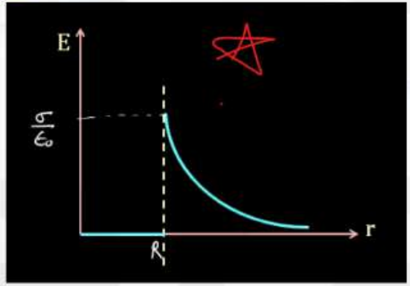
$$\frac{\rho d}{3\epsilon_0}$$

//

TRICK

EFI due to ∞ long uniformly charged cylindrical shell

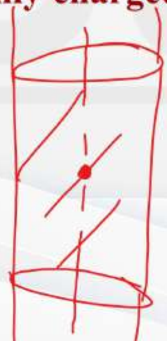


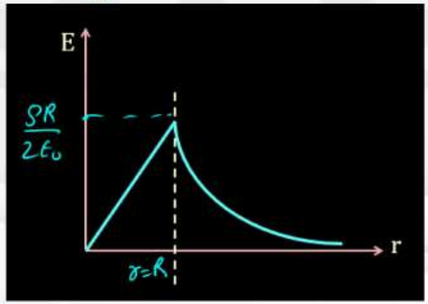


$r < R, \quad E = 0$

$r > R \quad E = \dfrac{\sigma R}{r\epsilon_o}$

EFI due to ∞ long uniformly charged solid cylinder

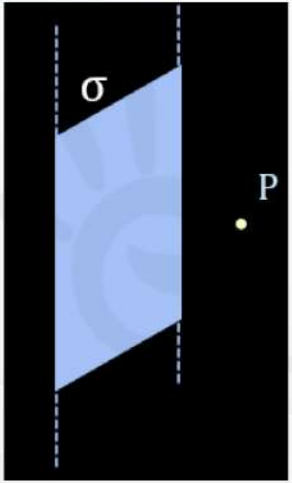




$r \leq R \quad E = \dfrac{\rho r}{2\epsilon_o}$

$r > R \quad E = \dfrac{\rho R^2}{2r\epsilon_o}$

EFI due to ∞ long uniformly charged sheet



$$E = \frac{\sigma}{2\epsilon_o}$$

Potential energy of a system of two point charges

$$U = \frac{kq_1q_2}{r}$$

Work done by electrostatic force

$$W = -\Delta U$$

Work done by electrostatic force in a closed loop = 0

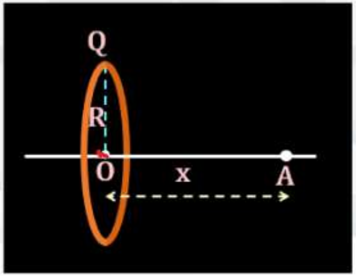
Work done by electrostatic force for two point charges depends only on initial and final separation and not on the path taken.

TRICK

Electric Potential $V = \frac{U_{int}}{q_0}$ Scalar

Due to point charge	$V_A = \frac{kQ}{r}$
Due to system of charges	$V_A = \frac{kQ_1}{r_1} + \frac{kQ_2}{r_2} + \frac{kQ_3}{r_3}$
At the center of thin charged spherical shell	$V_O = \frac{kQ}{R}$
At the center of uniformly charged ring	$V_O = \frac{kQ}{R}$
On the axis of uniformly charged ring	$V_A = \frac{k\,Q}{\sqrt{x^2 + R^2}}$ Trick

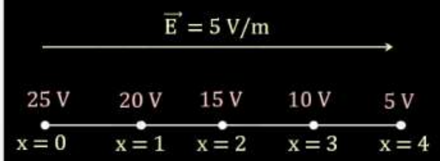
$E = \frac{kQ}{r^2}$



Electric potential from EFI

$$V_f - V_i = -\int_{r_i}^{r_f} \vec{E}.\, d\vec{r}$$

$$V_f - V_i = -\int_{x_i}^{x_f} E_x\, dx \; - \int_{y_i}^{y_f} E_y\, dy \; - \int_{z_i}^{z_f} E_z\, dz$$



Key Point

On moving in the direction of EFI electric potential decreases.

EFI from EP

$$E_r = -\frac{dV}{dr} \qquad \vec{E} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$$

$$W \rightleftharpoons U \rightleftharpoons V \rightleftharpoons E \rightleftharpoons F$$

$W = -\Delta U$

$$W = -\Delta U$$

$V = \dfrac{U_{int}}{q}$

$$U = qV$$

$E = -\dfrac{dV}{dr}$

$$\Delta V = -\int \vec{E} \cdot \vec{dr}$$

$F = qE$

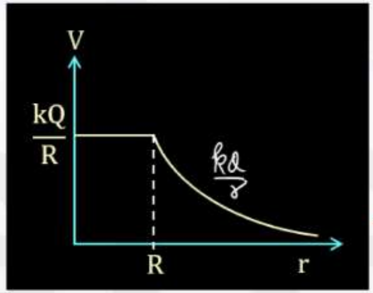
$$\frac{F}{q} = E$$

Electric potential due to

a. Uniformly charged thin spherical shell

$r < R$ $\qquad$ $V = \frac{kQ}{R}$,

$r > R$ $\qquad$ $V = \frac{kQ}{r}$,

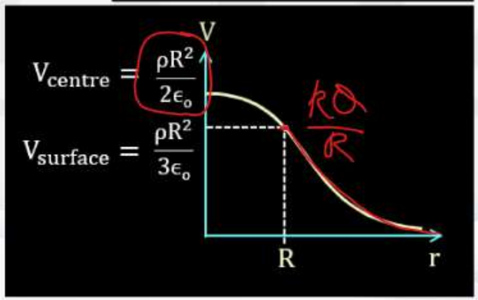


b. Uniformly charged solid sphere

$r < R \qquad V = \frac{\rho}{6\epsilon_o}(3R^2 - r^2)$

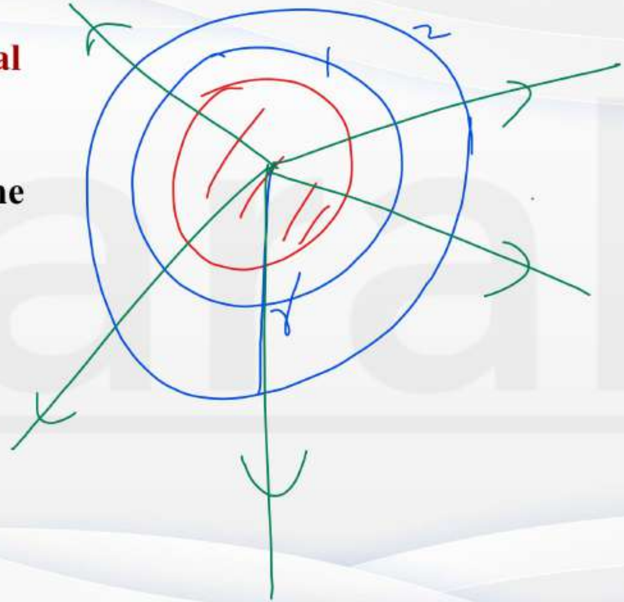
$r = R \qquad V = \frac{\rho R^2}{3\epsilon_o}$

$r > R \qquad V = \frac{kQ}{r}$,



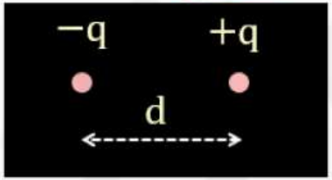
Equipotential Surface- same potential at each and every point

- Electric field is perpendicular to the Equipotential surface.



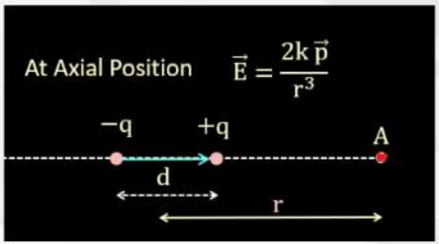
Electric Dipole moment

$p = |\vec{p}| = q\,d$



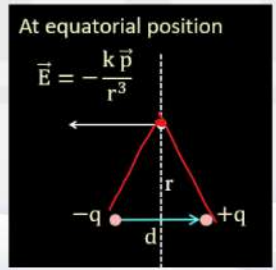
$\frac{kQ}{r^2}$ $\qquad \frac{k(Qd)\,p}{d^3}$

Trick



$$\vec{E} = \frac{2k\vec{p}}{r^3}$$

$$V_A = \frac{k\,p}{r^2}$$

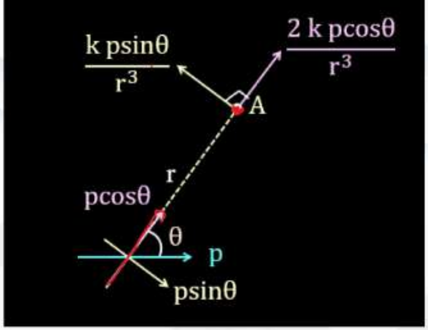


$$\vec{E} = \frac{-k\vec{p}}{r^3}$$

$$V = 0$$

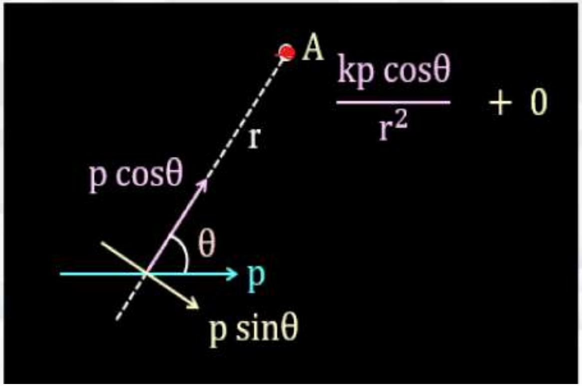
EFI at general point

$$|E_A| = \frac{kp}{r^3}\sqrt{3\cos^2\theta + 1}$$

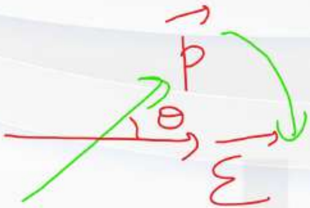


Electric potential at general point

$$V_A = \frac{k\,\vec{p}\,.\,\hat{r}}{r^2}$$

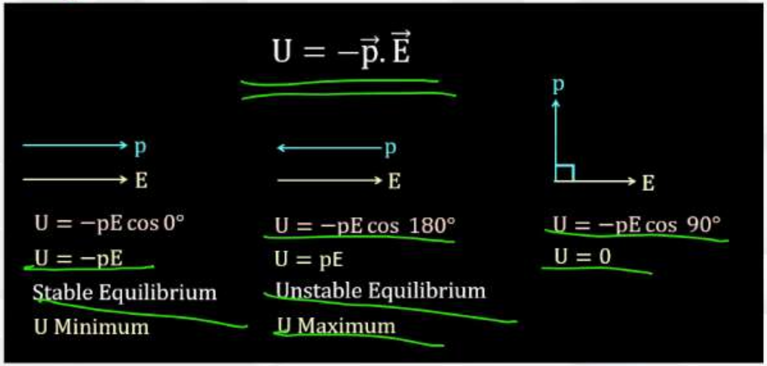


Torque of uniform $\vec{E}$ tries to align $\vec{p}$ in direction of $\vec{E}$ through smaller angle.

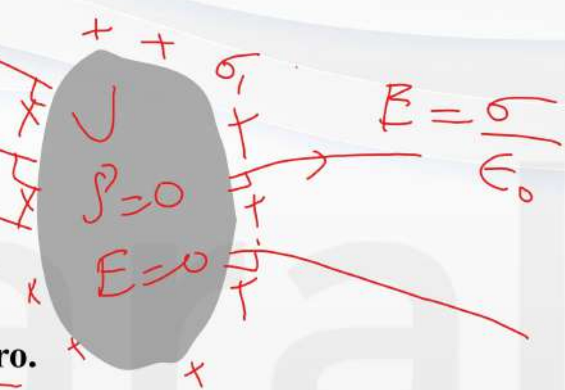


$$\vec{\tau} = \vec{p} \times \vec{E}$$

Electric potential energy of electric diapole of Electric field.



Electric Conductors



Having unlimited supply of free charge is called Conductor

- Electric Field is 0 inside a conductor in electrostatic steady state.
- Charge density inside a conductor is zero.
- Conductor is an equipotential body.

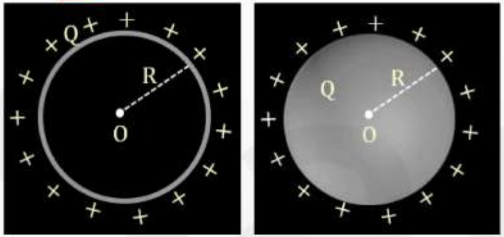
If a charge is given to a conductor then it will stay on the surface of conductor.

As surface of a conductor is an equipotential surface therefore net EFI at the surface of conductor is always perpendicular to the surface.

Electric potential due to spherical conductor

$$V_{in} = \frac{kQ}{R} = V_{surface}$$

$$V_{outside} = \frac{kQ}{r}$$



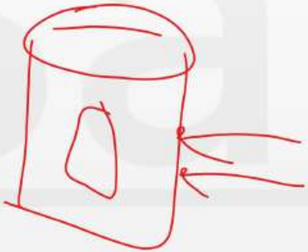
EFI on the surface of the conductor

$$\frac{\sigma}{\varepsilon_0}$$

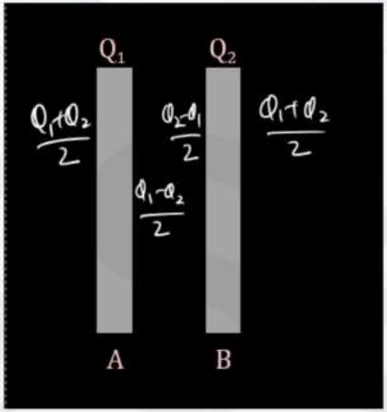
If a conductor is connected with earth through a conducting wire (earthing), potential of the conductor becomes zero

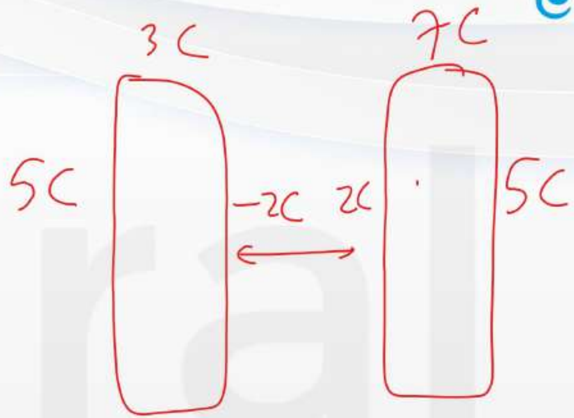
Faraday Cage

Electrostatic shielding, faraday cage is an enclosure to block electromagnetic fields



Parallel Conducting Plates





On facing surfaces, equal and opposite charges appear.

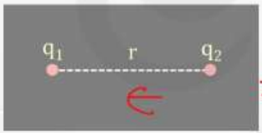
On outer most surfaces, $\frac{\sum Q_i}{2}$ charge appear.

Electrostatic pressure $P = \dfrac{\sigma^2}{2\epsilon_0}$

Energy Density $= \dfrac{1}{2}\epsilon_0 E^2$

Electric Field Intensity

Effect of medium on net electrostatic force

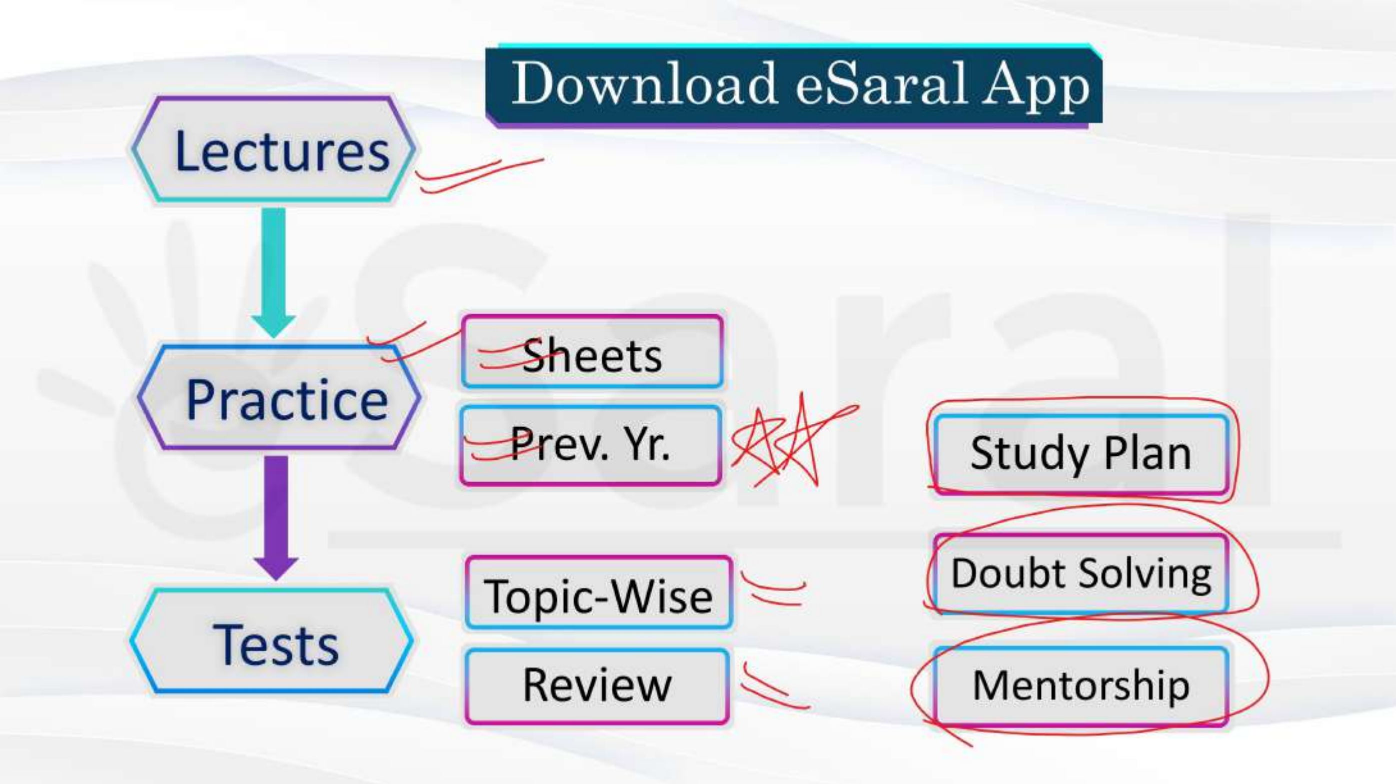


$$F_{net} = \frac{1}{4\pi\epsilon} \times \frac{q_1 q_2}{r^2}$$

Permittivity of Medium

$$\frac{\epsilon}{\epsilon_0} = \epsilon_r$$

Relative Permittivity of Medium w.r.t Vacuum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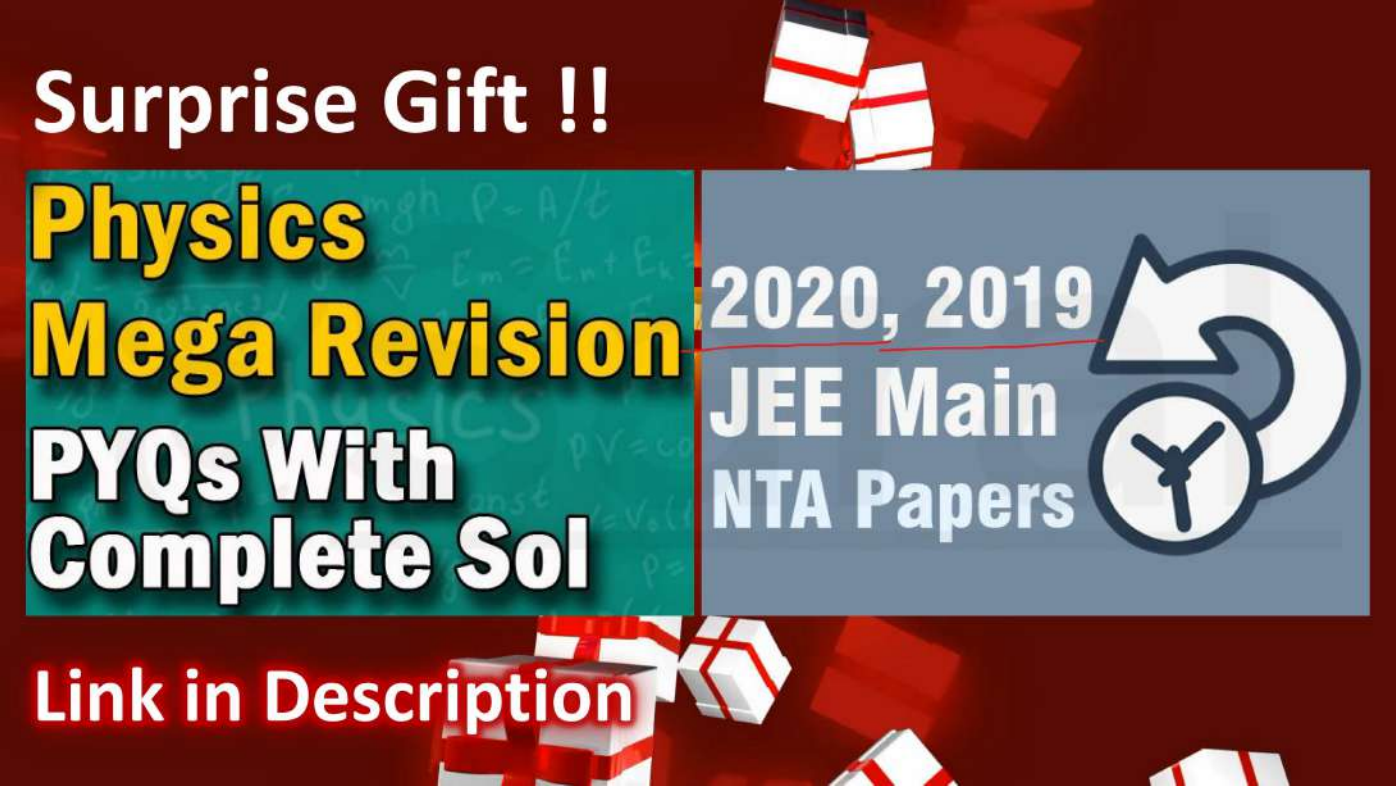
Mentorship Session
For eSaralites
15/10/20
08:00 PM
SARANSH SIR, Physics-HoD
AIR-41, IIT Bombay, CS


eSaral
4 Layered
DOUBT
SOLVING
eSaral है, तो सब सरल है।
L1
SOULTION OF PRACTICE SHEETS
L2
DEDICATED DOUBT HOTLINE
SOLVED
L3
LIVE DOUBT SOLVING CLASSES
L4
PERSONALISED CONNECT WITH FACULTIES



Surprise Gift !!
Physics
Mega Revision
PYQs With
Complete Sol
2020, 2019
JEE Main
NTA Papers
Link in Description

Lets Meditate !!

Current Electricity

Superfast Revision

Electric Current

Rate of flow of charge

SI unit -Ampere (A) $\frac{\text{Coulomb}}{\text{Second}}$

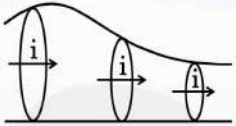
Instantaneous

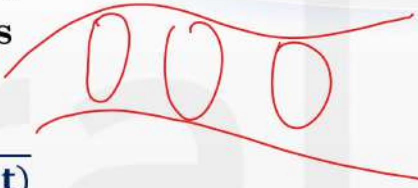
$$i = \frac{dQ}{dt}$$

Average

$$\langle i \rangle = \frac{\Delta Q}{\Delta t}$$

By convention, direction of flow of positive charge is taken as direction of flow of current.

Steady Current  **I is same through all cross sections**



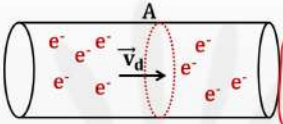
Current density $= \dfrac{\text{Amount of Current}}{\text{Cross sectional area } (\perp \text{ to current})}$

$$\Rightarrow j = \frac{i}{A_{\perp}}$$

$$i = \vec{j}.\vec{A}$$

$\vec{J} \cdot \vec{A}$

Drift velocity $\vec{v}_d = -\left(\frac{e\vec{E}}{m}\right)\tau$ where τ is avg. time between collisions

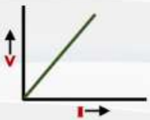


$i = n\,e\,A\,v_d$

OHM's law(Microscopic)

$\vec{E} = \rho\,\vec{j}$ where $\rho = \frac{m_e}{ne^2\tau}$

OHM's law(Macroscopic)



$V = i\,R$

V → Potential difference, i → Current, R → Resistance

PHYSICS WAHI jo Deewana BANA DE

$\rho_T = \rho_0(1 + \alpha\Delta T)$

Temperature coefficient of resistivity

$\rho_2 = \rho_1[1+\alpha(T_2-T_1)]$

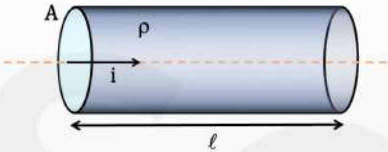
$\rho_T = \rho_0(1+\alpha\Delta T)$

$R_T = R_0(1+\alpha\Delta T)$

$$\text{Conductivity} = \frac{1}{\text{Resistivity}}$$

Resistance of the body

$$R = \frac{\rho \ell}{A}$$



ρ is a property of material
R is a property of body.

Dependency of R on Temperature (T)

$$R_2 = R_1 (1 + \alpha (T_2 - T_1))$$

α is Temperature coefficient of Resistance

$$\text{Conductance} = \frac{1}{\text{Resistance}}$$ Unit is mho (Ω^{-1})

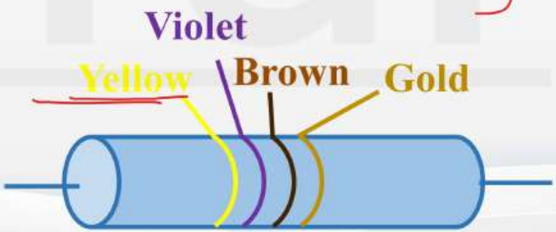
$47 \times 10^1 \pm 5\%$

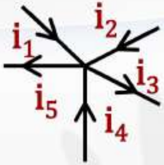
TRICK

Colour	Number	Multiplier	Tolerance (%)
Black	0	1	
Brown	1	10^1	
Red	2	10^2	
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	
Blue	6	10^6	
Violet	7	10^7	
Gray	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
No colour			20

BB ROY of Great Britain has a Very Good Wife

$R = 47 \times 10^1 \pm 5\%$



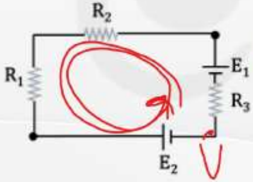


Kirchhoff's Current Law (KCL)

At Junction $\sum$ Current Entering $= 0$

Current Entering = Current Leaving

Based on conservation of charge.



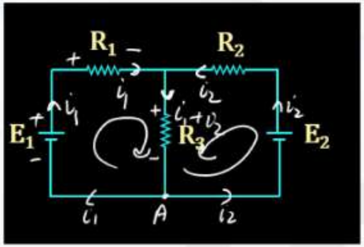
Kirchhoff's Voltage Law (KVL)

The algebraic sum of changes in potential around any closed loop is zero.

Based on conservation of energy.

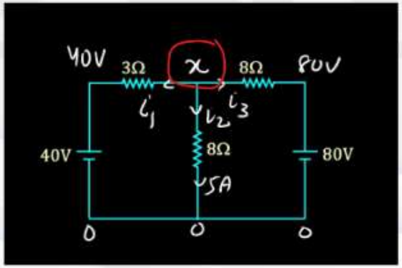
Mesh Analysis

1. Assume current using KCL
2. In loops apply KVL



Nodal Analysis

1. Assume potential in a circuit (at junction) and try to assign minimum variables.
2. Apply KCL at junction.



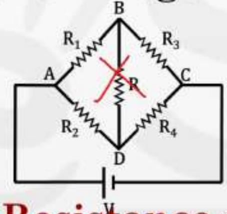
$$\frac{x-0}{8}+\frac{x-40}{3}+\frac{x-80}{8}=0$$

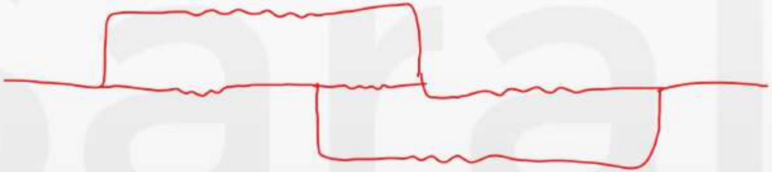
Parallel Combination (V is same), $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$

Series Combination (i is same) , $R_{eq} = R_1 + R_2 + \cdots$

Wheatstone Bridge

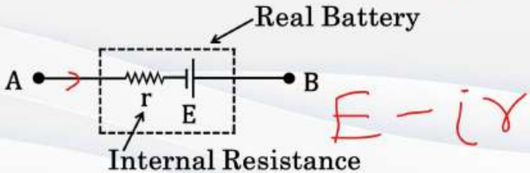
$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$





Internal Resistance and Terminal Voltage of a Battery

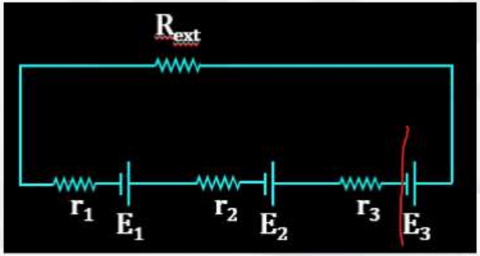
$$V_A - iR + E = V_B$$



Series Combination of Batteries

$$r_{eq} = r_1 + r_2 + r_3$$

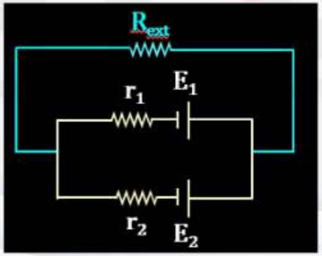
$$E_{eq} = E_1 + E_2 + E_3$$



Parallel Combination of Batteries

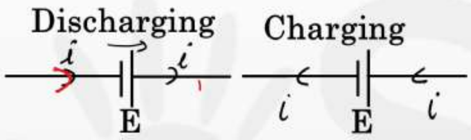
$$\frac{1}{r_{eq}} = \frac{1}{r_1} + \frac{1}{r_2}$$

$$\frac{E_{eq}}{r_{eq}} = \frac{E_1}{r_1} + \frac{E_2}{r_2}$$



Power Delivered Through a Device $P = Vi$

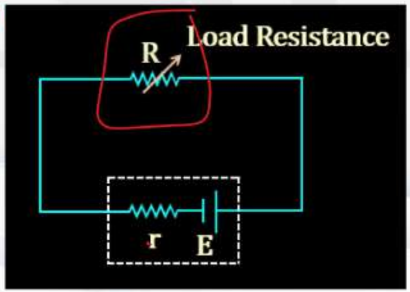
Power Delivered by Battery



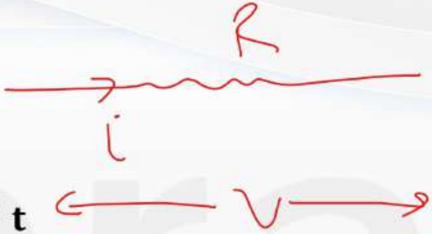
$= E\,i$ (Discharging) $= -Ei$ (Charging)

Maximum Power Transmission Theorem

Power consumed by load resistance will be maximum when its value is equal to internal resistance of battery.



Power Consumed by a Resistor

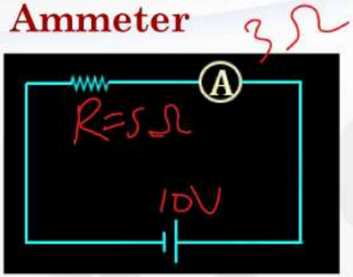


$$P_{loss} = Vi = i^2 R = \frac{V^2}{R}$$

Heat loss by resistor in time 't' $= i^2 R t = \dfrac{V^2 t}{R}$

Pt

Ammeter



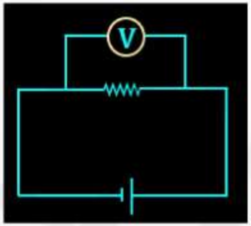
Ammeter is an instrument used to measure current.

Ammeter is connected in series to the branch in which current is to be measured.

Ideal ammeter has zero resistance.

As this is not possible practically, therefore ammeter should have minimum resistance.

Voltmeter



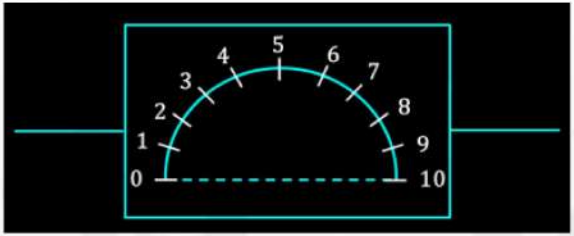
Voltmeter is an instrument used to measure potential difference.

Voltmeter is connected in parallel to the branch in which potential difference is to be measured.

Ideal voltmeter has infinite resistance.

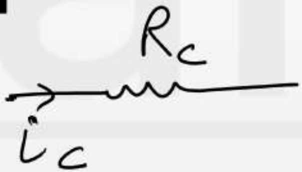
Real voltmeter should have very large resistance.

Galvanometer



Range : 0 - 10 mA

Full deflection current



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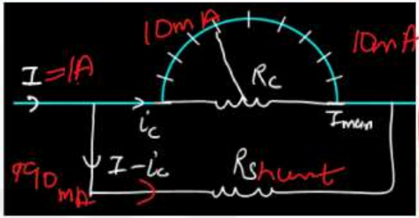
Conversion of Galvanometer into Ammeter

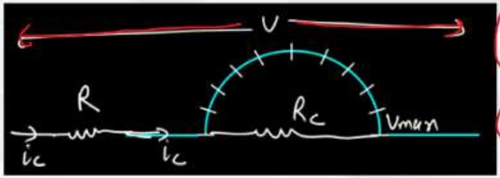


$$i_cR_c = (I - i_c)R_s$$

$$I = i_c\frac{(R_c + R_s)}{R_s}$$

A ↓ less

Conversion of Galvanometer into Voltmeter



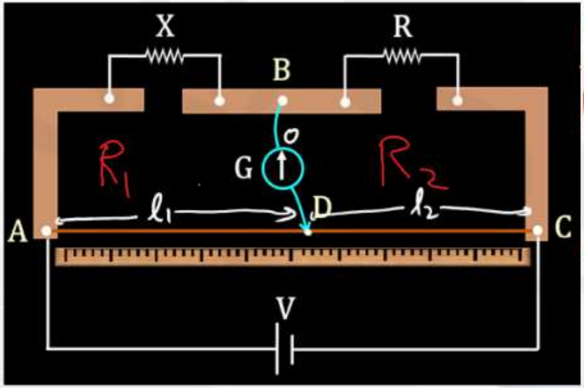
$$V = i_c(R + R_c)$$

$$V_{max} = i_{max}(R + R_c)$$

V R ↑

Meter Bridge

It is used to find the unknown resistance.

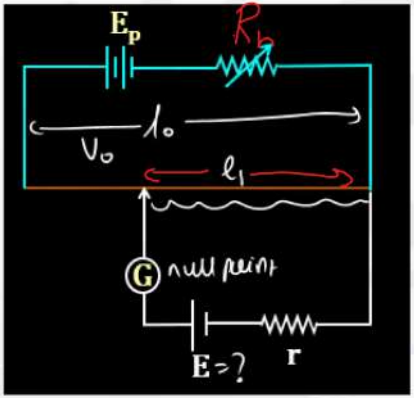


$$X = \left(\frac{\ell_1}{\ell_2}\right) R$$

$$X = \left(\frac{\ell_1}{100 - \ell_1}\right) R$$

Application of Potentiometer

1) To find EMF of the battery

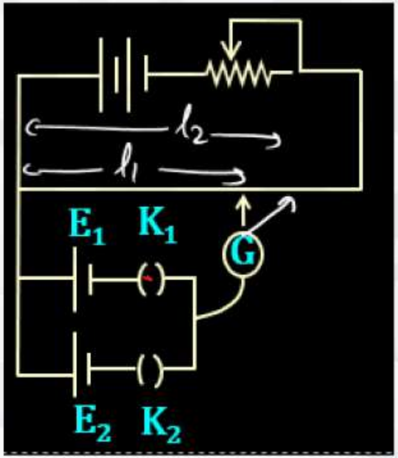


$$\text{Pot gradient} = \frac{V_0}{\ell_0}$$

$$E = \left(\frac{V_0}{\ell_0}\right)\ell_1$$

Application of Potentiometer

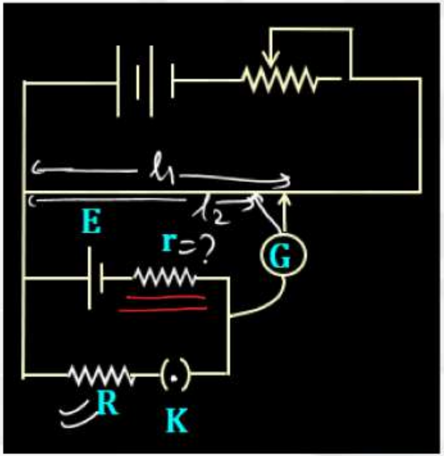
2) To compare EMF of batteries



$$\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2}$$

Application of Potentiometer

3) To find internal resistance of a battery



i) K open & null point → ℓ_1

ii) K close & null point → ℓ_2

$$r = R\left(\frac{\ell_1}{\ell_2} - 1\right)$$

Lets
Meditate !!

Capacitor

Superfast Revision

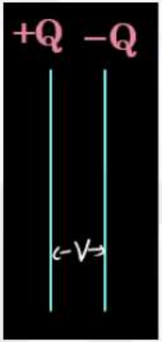
Capacitor

Capacity of a Capacitor, $C = \frac{Q}{V}$

SI unit of Capacity (Capacitance) is Farad

1 Farad is a very BIG unit. $\mu F(10^{-6}F)$, $nF(10^{-9}F)$, $pF(10^{-12}F)$

$$Q = CV$$



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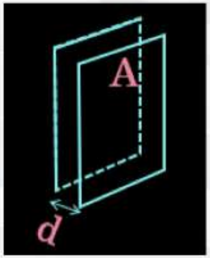
Capacity of a Capacitor depends on

1) Shape and size of the plates

2) Distance between plates

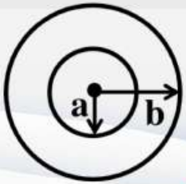
3) Medium between the plates

Parallel Plate Capacitor $C = \frac{A\varepsilon_0}{d}$



d → 0

Spherical Capacitor $C = \frac{4\pi\varepsilon_0 ab}{b-a}$

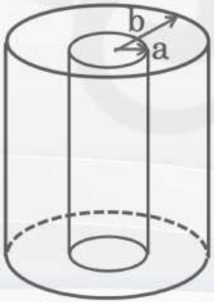


a ≈ b

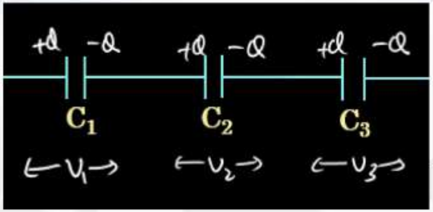
Cylindrical Capacitor

$$C = \frac{2\pi\varepsilon_0 l}{\ln\left(\frac{b}{a}\right)}$$

TRICK

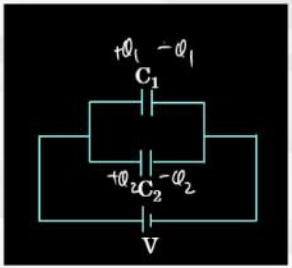


Series Combination (charge is same), $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots$



$$V_1 : V_2 : V_3 = \frac{1}{C_1} : \frac{1}{C_2} : \frac{1}{C_3}$$

Parallel Combination (V is same) , $C_{eq} = C_1 + C_2 + \cdots$



$$\frac{Q_1}{Q_2} = \frac{C_1}{C_2}$$

$$Q_1 = C_1 V_1$$

$$Q_2 = C_2 V_2$$

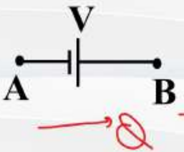
Mesh Analysis

- Assume charge using Junction Law.
- Apply KVL

Nodal Analysis

- Assume potential in a circuit.
- Apply Junction Law

Work Done By Battery



$W = QV$

Energy Stored in a Capacitor $= \frac{1}{2}CV^2 = \frac{Q^2}{2C} = \frac{1}{2}QV$

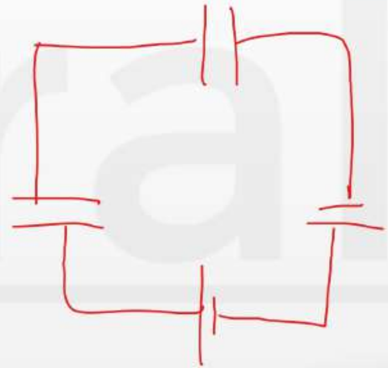
$Q = CV$

Heat Generated in Circuit $H = \sum W_b - \sum \Delta E$

$\Delta E = (E_f - E_i)$

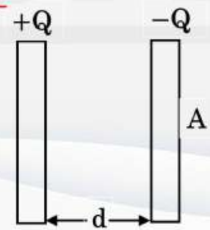
$\sum W_b$ = **Work done by all batteries**

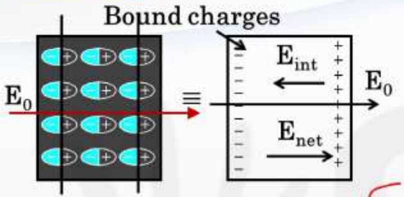
$\sum \Delta E$ = **Energy change in all capacitors**



Electrostatic Force b/w the Plates of a Parallel Plate Capacitor

$$F = \frac{Q^2}{2A \in_0}$$





$K = \varepsilon_r$

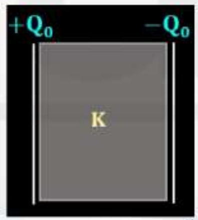
$$E_{net} = \frac{E_0}{K}$$ [K is dielectric constant]

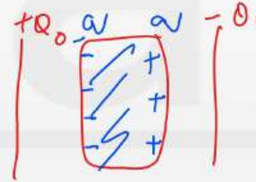
$1 \le K \le \infty$

Vacuum — Conductors

Dielectric Inside Capacitor

$$E_{net} = \frac{E_0}{K} \qquad C = KC_0$$





Bound Charges (Induced Charges) on Dielectric

$$q = Q\left(1 - \frac{1}{K}\right)$$

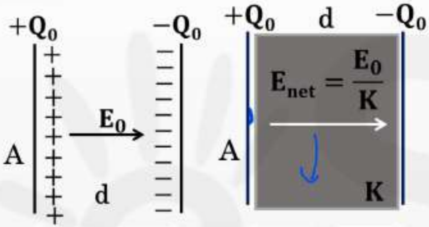
TRICK

$q < Q$

Effect on Parameters due to Introduction of Dielectric Slab (Completely Filled)

TRICK

1. Battery is not connected

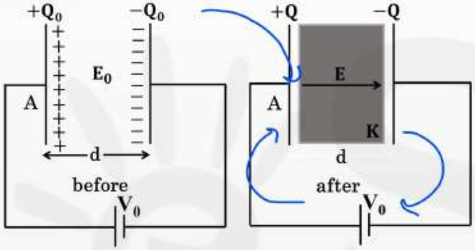


$U = \frac{1}{2}CV^2$

Before	After
Q_0	Q_0
C_0	KC_0
E_0	E_0/K
V_0	V_0/K
U_0	U_0/K

Effect on Parameters due to Introduction of Dielectric Slab (Completely Filled)

2. Battery is connected

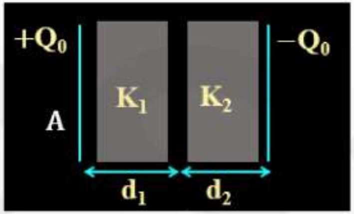


TRICK

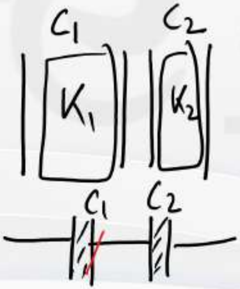
Before	After
Q_0	KQ_0
C_0	KC_0
E_0	E_0
V_0	V_0
U_0	U_0K

Different Combination of Dielectrics

Q) Find $C_{eq.}$



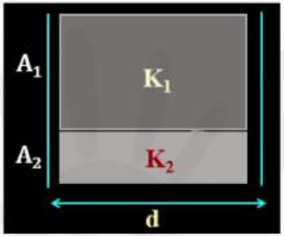
Sol.



$$C_1 = \frac{A\varepsilon_0 K_1}{d_1} \qquad C_2 = \frac{A\varepsilon_0 K_2}{d_2}$$

$$C_{eq} = \frac{C_1 C_2}{C_1 + C_2} = \frac{\dfrac{A^2\varepsilon_0^2 k_1 k_2}{d_1 d_2}}{A\varepsilon_0\left[\dfrac{k_1}{d_1} + \dfrac{k_2}{d_2}\right]}$$

Q) Find $C_{eq.}$



Sol.

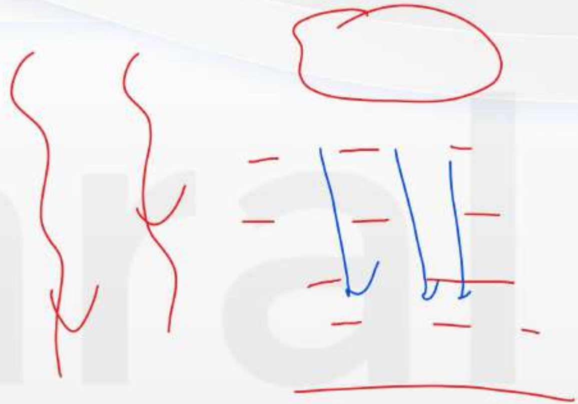
$$C_{eq} = C_1 + C_2$$

$$C_1 = \frac{A_1 \epsilon_0 K_1}{d} \qquad C_2 = \frac{A_2 \epsilon_0 K_2}{d}$$

Dielectric Strength

The maximum electric field that a medium can withstand without breakdown (of its insulating property) is called dielectric strength of the medium.

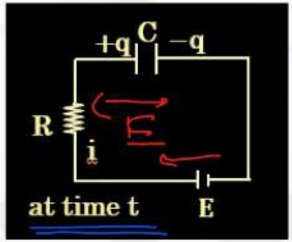
For air it is about $3\times 10^{6}V/m$



Charging of Capacitor

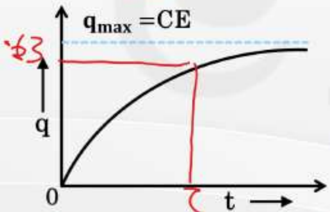
$$q = CE\left(1 - e^{-t/RC}\right)$$

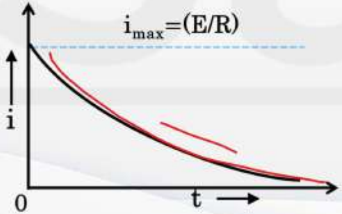
$$i = \frac{E}{R}\left(e^{-t/RC}\right)$$



Time Constant (τ) $\tau = RC$

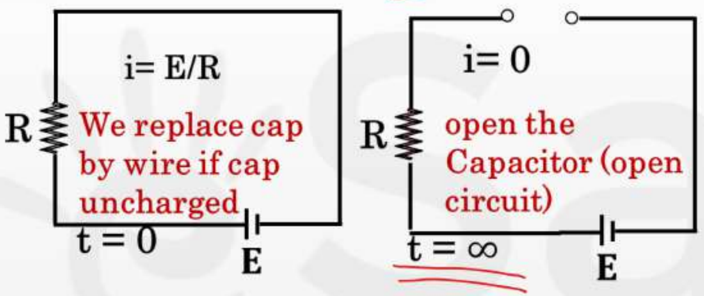
After 1τ time capacitor gets 63% charged





$$\text{Heat Loss} = \frac{Q_0^2}{2C}$$

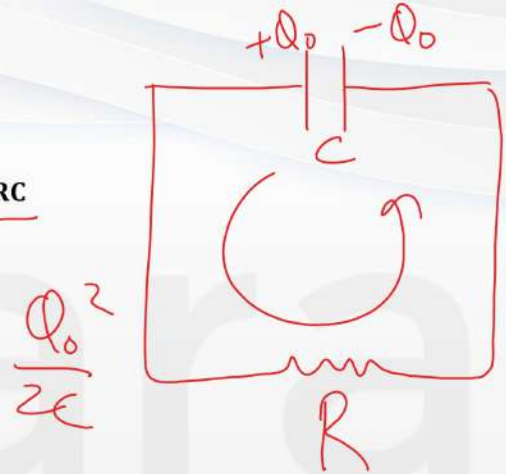
Calculation of current at t = 0 and t = ∞



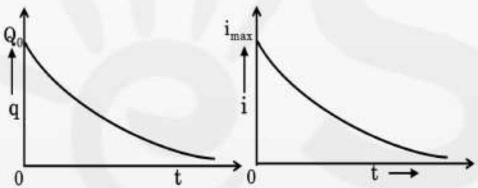
In 1τ approx capacitor 63% discharged

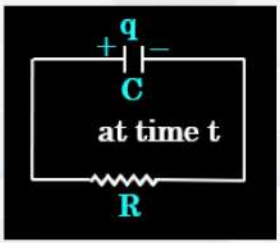
$q = Q_0 e^{-t/RC}$

$i = i_{max.} e^{-t/RC}$



Discharging of Capacitor





Heat Loss $= \frac{Q_0^2}{2C}$

Lets Meditate !!

Complete Physics Mega Revision Timetable

15 Feb
Electrostatics
Current electricity
Capacitor
🎁 Surprise Gift 🎁

16 Feb
Calorimetry
Elasticity
Thermal Expansion
Heat Transfer
KTG
Thermodynamics
Fluid Mechanics

17 Feb
Magnetic effect of current
Manetism and matter
Emi
AC

18 Feb
UD
Vector
Kinematics 1D
Kinematics 2D
NLM
Friction
Circular motion
Work power energy
COM
Rotation motion

19 Feb
Ray optics
Optical Instruments
Wave optics
EM Waves
Errors in measurement

20 Feb
Gravitation
SHM
Wave on string
Sound wave

21 Feb
Dual nature of radiation
X-rays
Nuclear physics
Radioactivity
Semi conductor
Communication system

11-13
13th
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