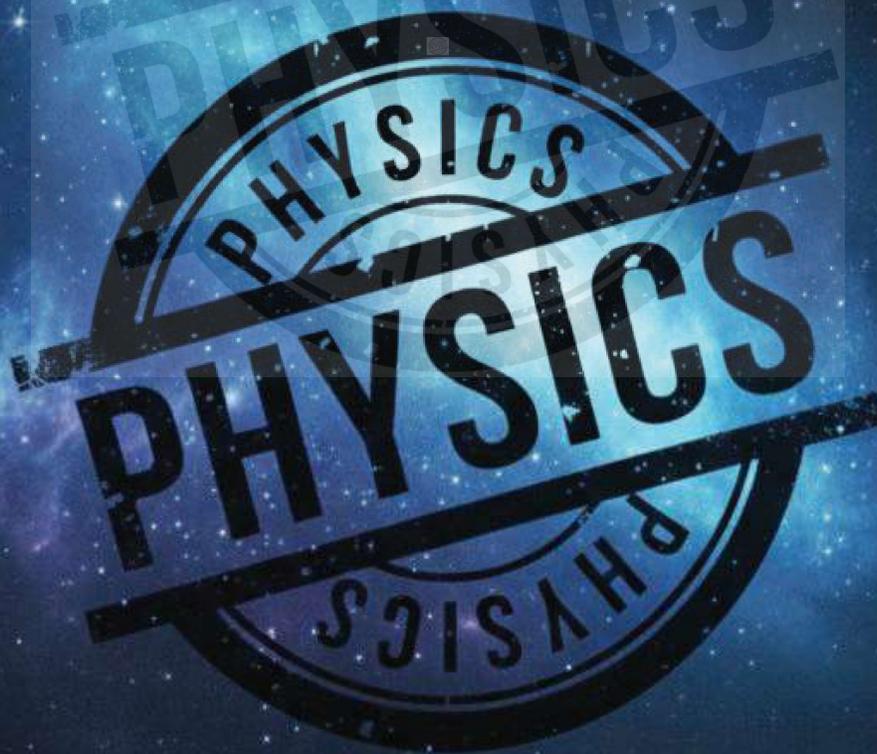


Class 12th PHYSICS Short Notes

JEE MAIN | JEE ADVANCED | NEET



YOUR NAME HERE
PUBLISHER



Index

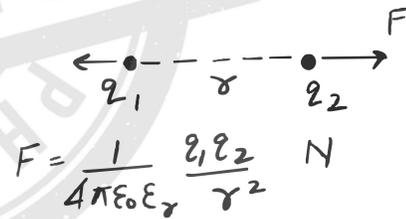
S.No.	Chapter Name	Page No.	
1	Electrodynamics	Electrostatics	1
		Capacitors	8
		Current Electricity	14
		Moving Charges & MEC	22
		Earth's Magnetism	28
		Magnetic Properties of Matter	32
		Electromagnetic Induction	35
		Alternating Current	41
2	Ray Optics & Optical Instruments	Ray Optics	46
		Optical Instruments	55
3	Wave Optics & EM Waves	YDSE & Interference	59
		Diffraction & Polarization	64
		EM Waves	69
4	Semiconductors	Fundamentals & Zener Diode	72
		Transistors	75
		Logic Gates	79
5	Communication Systems	83	
6	Modern Physics	Atomic Physics	89
		Photoelectric Effect	92
		Dual Nature of Light	95
		Radioactivity	98
		Nuclear Physics	101
		X Rays	104

Topics to cover in ELECTROSTATICS – PART 1 (ELECTRODYNAMICS)

1. Coulomb's Law
2. Electric Field & Standard Line diagram
3. Electric Field due to line charge
4. Electric Field due to a charged ring
5. Electric Field due to a charged disc
6. Electric Field due to a charged sphere
7. Electric Field due to Non-Uniform Charge Distribution
8. Electrostatic Potential (ring & sphere)
9. Electrostatic Potential Energy (self energy)
10. Relation between E & V
11. Electric Dipole
12. Electric Flux
13. Conductors

1. COULOMBS LAW

$Q = n e^-$, $n \in \mathbb{I}$
 $e = 1.6 \times 10^{-19} \text{ C}$



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

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$$

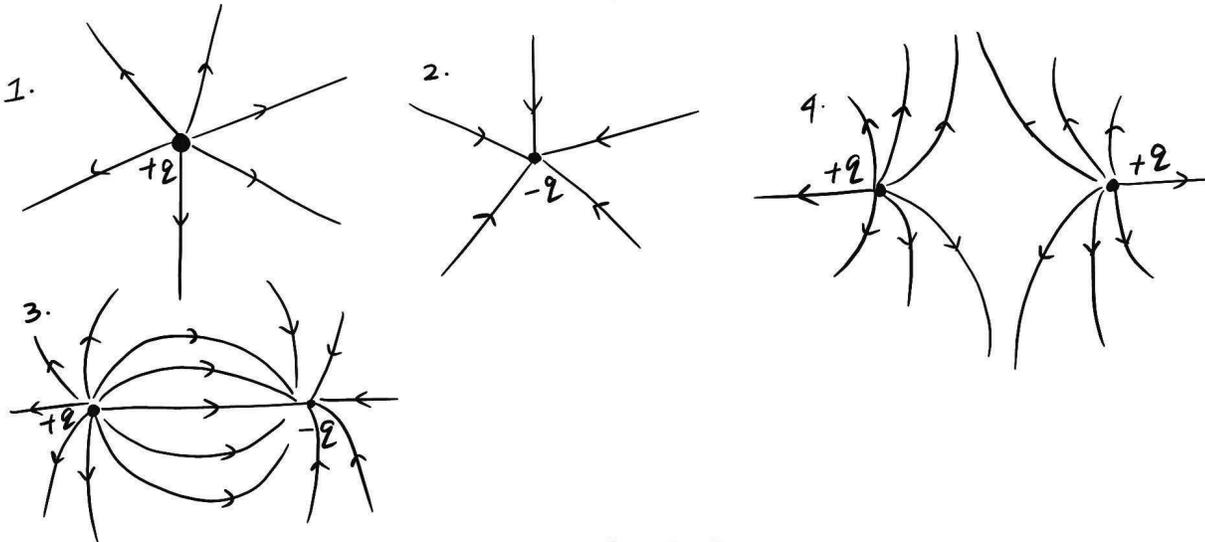
ϵ_0 : permittivity of free space
 $8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$

ϵ_r : relative permittivity of medium

VECTOR FORM: $\vec{F}_{21} = \frac{k q_1 q_2 (\vec{r}_2 - \vec{r}_1)}{|\vec{r}_2 - \vec{r}_1|^3}$

* Put q_1 and q_2 with sign.

2. ELECTRIC FIELD ($E = kq/r^2$), N/C



3. ELECTRIC FIELD DUE TO LINE CHARGE

(CHARGE IS UNIFORMLY DISTRIBUTED)

FINITE LENGTH

$$E_{\perp} = \frac{K\lambda}{d} (\sin\theta_1 + \sin\theta_2)$$

$$E_{\parallel} = \frac{K\lambda}{d} (\cos\theta_2 - \cos\theta_1)$$

SEMI-INFINITE

$\theta_1 = 90^\circ, \theta_2$

IN FINITE

$\theta_1 = \theta_2 = 90^\circ$

$$E_{\perp} = \frac{2K\lambda}{d} = \frac{\lambda}{2\pi\epsilon_0 d}$$

$$E_{\parallel} = 0$$

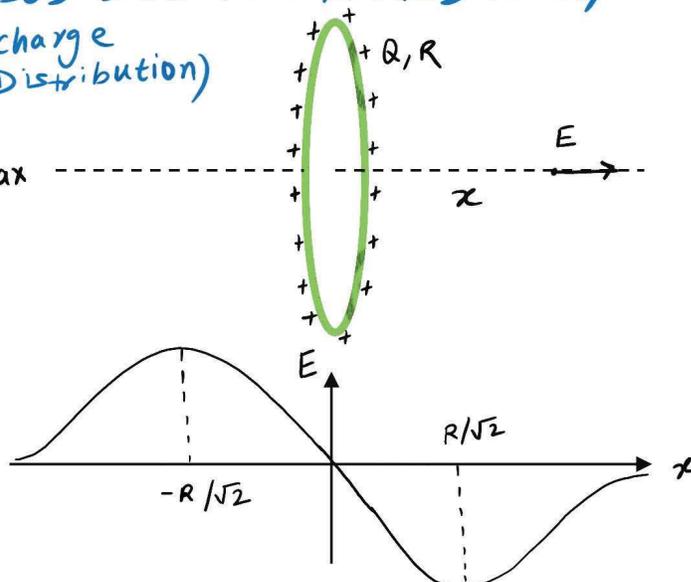
4. ELECTRIC FIELD DUE TO CHARGED RING

(uniform charge distribution)

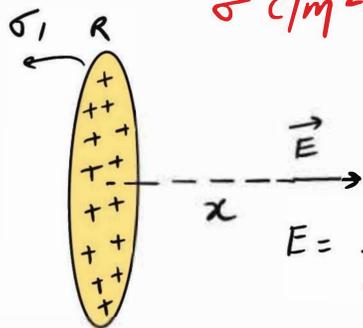
$$E = \frac{KQx}{(x^2 + R^2)^{3/2}}$$

↳ at $x = \pm R/\sqrt{2}$, E is Max

↳ at $x = 0$, $E = 0$
(center)



5. ELECTRIC FIELD DUE TO CHARGED DISC PART 1 - ELECTROSTATICS
 $\sigma \text{ C/m}^2$ (UNIFORM CHARGE Distribution)



$$E = \frac{\sigma}{2\epsilon_0} \left(1 - \frac{x}{\sqrt{x^2 + R^2}} \right)$$

Case I If Disc is very large ($x \ll R$)

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

↳ for infinite sheet

6. ELECTRIC FIELD DUE TO CHARGED SPHERE

CONDUCTOR
(Hollow or solid, Q is on surface)

(1) For $r < R$, $E = 0$
 (2) For $r > R$, $E = \frac{KQ}{r^2}$

NON-CONDUCTOR
(uniformly in solid) $\rho \text{ C/m}^3$

(1) $r < R$, $E = \frac{KQr}{R^3}$ or $\frac{\rho r}{3\epsilon_0}$
 (2) $r > R$, $E = \frac{KQ}{r^2}$

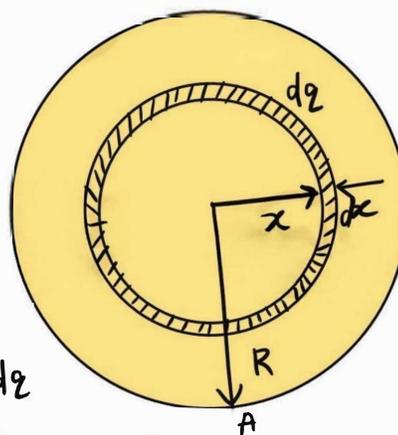
7. ELECTRIC FIELD (NON-UNIFORM CHARGE Distribution)

1. $dq = \lambda(x) dx$

$$E = \int_a^b \frac{k\lambda(x) dz}{x^2}$$

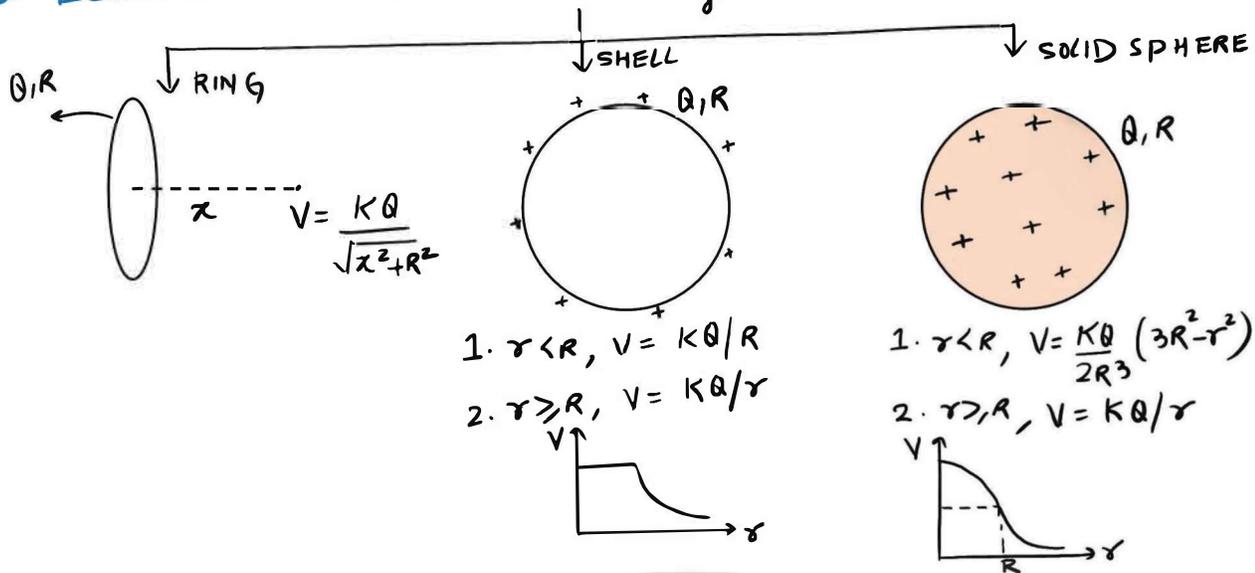
$$E_A = \frac{kQ_{in}}{R^2}$$

2.



$$Q_{in} = \int_0^R \rho(x) \times 4\pi x^2 dx$$

8. ELECTROSTATIC POTENTIAL $V = \frac{KQ}{r}$, put Q with sign. PART 1 - ELECTROSTATICS



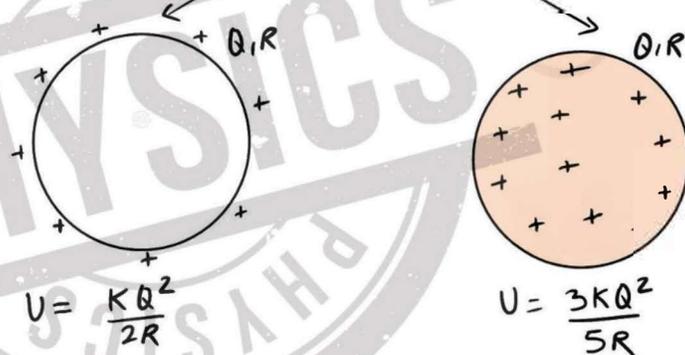
9. ELECTROSTATIC POTENTIAL ENERGY

SELF ENERGY



$U = Kq_1q_2 / r$

↳ put q_1 and q_2 with sign



10. RELATION BETWEEN E and V

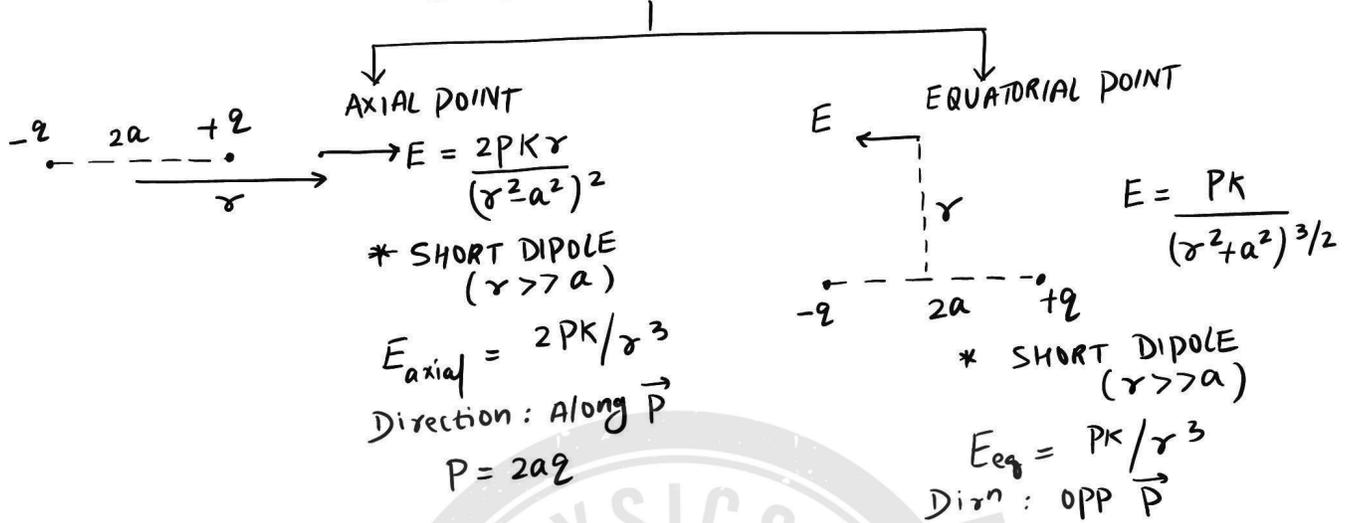
(1.) $\vec{E} = -\frac{\partial V}{\partial x} \hat{i} - \frac{\partial V}{\partial y} \hat{j} - \frac{\partial V}{\partial z} \hat{k}$

(2.) $\Delta V = -\int \vec{E} \cdot d\vec{r}$

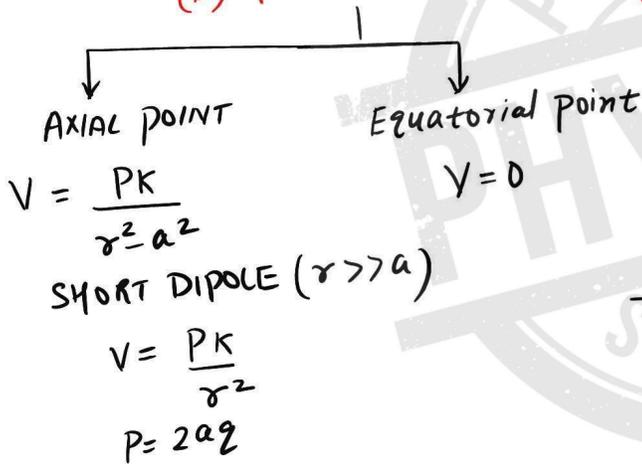
} Here $\frac{\partial V}{\partial x}$ means differentiate V w.r.t x keeping y and z constant.

II. ELECTRIC DIPOLE ($-q$ \dots $+q$, $P = qd$, direction from $-ve$ to $+ve$)

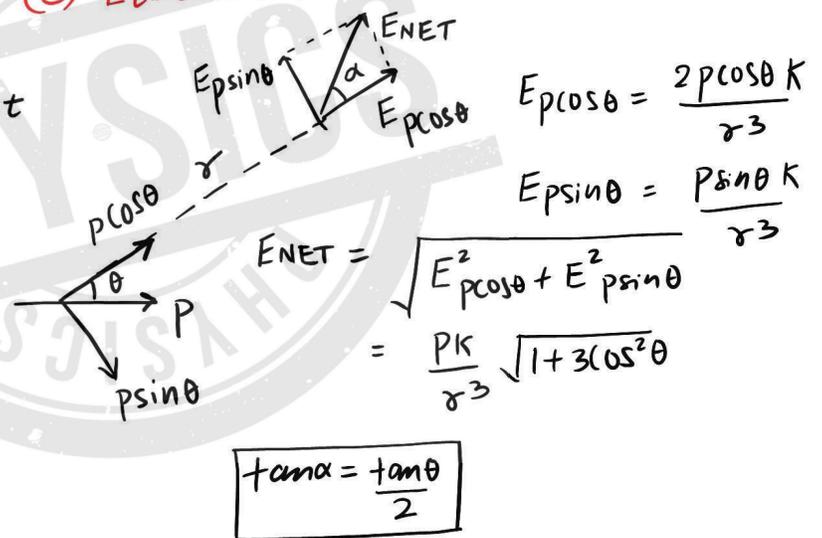
(a) ELECTRIC FIELD



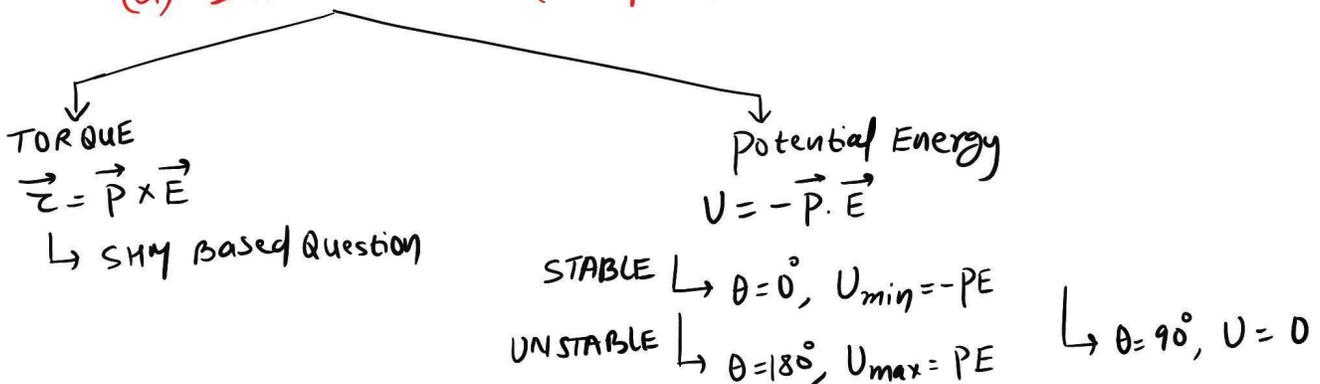
(b) POTENTIAL



(c) ELECTRIC FIELD AT GENERAL POINT



(d) DIPOLE IN E (uniform)

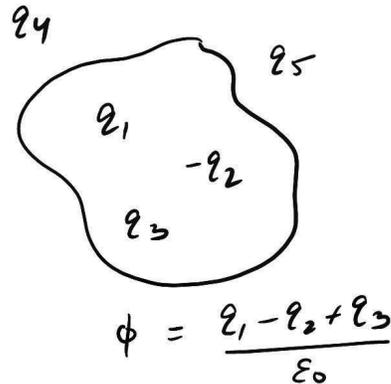


12. ELECTRIC FLUX ($\phi = \vec{E} \cdot \vec{A}$)

GAUSS'S LAW

$$\hookrightarrow \oint \vec{E} \cdot d\vec{A} = \frac{q_{in}}{\epsilon_0}$$

- ① q_{in} : charge enclosed
 ② E : Electric field is due to all the charges.



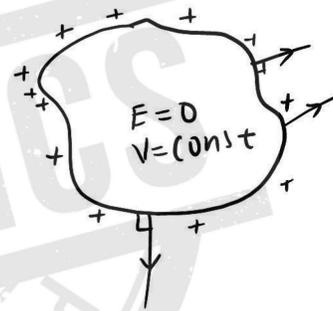
Solid ANGLE



$$\Omega = 2\pi(1 - \cos\alpha)$$

13. CONDUCTOR

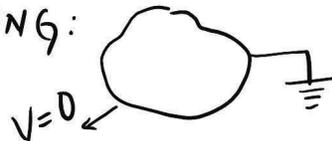
- (1.) charge remains on surface
 (2.) Electric field inside is zero
 (3.) V is constant
 (4.) Field lines are \perp to surface



(5.) CONNECTING TWO CONDUCTORS

\hookrightarrow They share charge until V of both bodies are same.

(6.) EARTHING:



V of body will always be zero

Space to add concepts learnt from PYQs if any

