# CHAP 6

Newton's law of gravitation
(mass) $F = m_1 m_2$ (distance) $F = 1/r^2$

Acceleration due to gravity at the surface of earth:

$$g = \frac{GMe}{Re^2}$$ where, $G = 6.67\times10^{-11}\ Nm^2/kg$
$me = 6\times10^{24} kg$
$Re = 6.4\times10^{6} m$

In terms of density:

$$g = \frac{4}{3} G \rho \pi Re$$

In terms of %:

$$\%g = \%m - 2\%R$$ Increase value $+ve \uparrow$
Decrease value $-ve \downarrow$

At height:

$$g' = \frac{GMe}{(Re+h)^2}$$

Distance from the centre of the earth where the value of "g" becomes "n" time

$(Re+h) = S = \sqrt{\text{Inverse of value}} \times R$ $n$ = lesser than one

Distance from the surface of the earth where the value of "g" becomes "n" time

$$h = (\sqrt{\text{Inverse of value}} - 1) \times R$$

Variation of "g" with altitude:

$$g' = g\left(1 - \frac{2h}{Re}\right)$$

Value of "g" at a distance "n" times the earth radius above the earth surface.

$$\underset{\text{At height}}{g'} = \left(\frac{1}{\{1+\text{value}\}^2}\right) \underset{\text{surface of earth}}{g}$$ (value of n)

In terms of weight:

$$\underset{\text{At height}}{W'} = \left\{\frac{1}{(1+\text{value})^2}\right\} \underset{\text{surface of earth}}{W}$$

Date

Variation of "g" with depth:-

$$g' = g\left[1 - \frac{d}{Re}\right]$$

Value of "g" at depth "n" times the earth radius

$$g' = (1 - \text{value})\,g$$

In terms of weight

$$w' = (1 - \text{value})\,w$$

depth from the surface where the value become "n" time

$$d = (1 - \text{value})\,Re$$

Value of "g" on other planets:

$$\frac{g'}{g} = \frac{m}{R^2} \times m/e\ \frac{Re^2}{me}$$ {In terms of mass}

$$\frac{g'}{g} = \frac{\text{mass value}}{(\text{Radius/Diameter value})^2}$$ (Reduced form)

In terms of density:

$$\frac{g'}{g} = \frac{\rho \times R}{\rho e \times Re}$$

$$\frac{g'}{g} = (\rho\ \text{value}) \times (R/D\ \text{value})$$ (Reduced form)

Orbital Velocity:

$$V = \sqrt{\frac{Gm}{R}}$$

$R = Re + h$

Escape velocity:-

$$V_{esc} = \sqrt{\frac{2Gm}{R}}$$

$V_{esc} = \sqrt{2gR}$ {R = radius of planet}

Time period of revolution:-

$T^2 \propto R^3$

$$T = (R\ \text{value})^{3/2} \times 365$$

Date

Kapler's law:-

Angular momentum

$T^2 = kR^3$

$$\boxed{k = \frac{T^2}{R^3}}$$

$$\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2}$$

→ Two planets revolve around the earth with $T_1$ & $R_1$ & the other $T_2$ & $R_2$ what is their ratio.

Frequency of spinning:-

$$f = \frac{1}{2\pi}\sqrt{\frac{a}{R}}$$

weight cases & other book

# Chap 4 Motion In Two Dimension

1) Time taken to reach the max. height :-

$$t = \frac{V_0 \sin\theta}{g} \text{ or } \frac{V_{oy}}{g}$$

2) Total time to reach the ground:-

$$T = \frac{2V_0 \sin\theta}{g}$$

3) Maximum height :-

$$h = \frac{V_0^2 \sin^2\theta}{2g}$$

4) Horizontal Range:-

$$R = \frac{V_0^2 \sin 2\theta}{g}$$

5) Maximum Range:-

$$R_{max} = \frac{V_0^2}{g}$$

6) Relation:-

$4h = R\tan\theta$

7) $k' = k\cos^2\theta$

8) $P' = P\cos\theta$

9) Radian:-

$\theta = S/r$

10) Angular Velocity:-

$$\omega = \frac{\theta}{t}$$

$V = r\omega$

$\bar{a} \sqrt{a^2c + a^2t}$

Date

11) Angular Acceleration:-

$$\alpha = \frac{\omega f - \omega i}{t}$$

$$a_t = r\alpha$$

12) Centripetal force:-

$$\Rightarrow F = \frac{mv^2}{r}$$

$$\Rightarrow F = mr\omega^2 \quad , v = r\omega$$

$$\Rightarrow F = \frac{4\pi^2 mr}{T^2} \quad , \omega = \frac{2\pi}{T}$$

13) Centripetal acceleration:-

$$F = \frac{v^2}{r}$$

$$F = r\omega^2$$

$$F = \frac{4\pi^2 r}{T^2}$$

$$F = 4\pi^2 r f^2$$

## Chap # ~~07~~ 07
## WORK, POWER & ENERGY

WORK:-

$$W = \vec{F} \cdot \vec{S}$$

$$W = FS\cos\theta$$

ENERGY:-

$$K.E. = \frac{1}{2} mv^2$$

WORK ENERGY EQUATION:-

$$K.E = (W - f)h$$

Elastic P.E :-

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

$$\frac{U_1}{U_2} = \left(\frac{x_1}{x_2}\right)^2$$

Relation b/w K.E & mass :-

$$\frac{k_1}{k_2} = \left(\frac{m_2}{m_1}\right)$$

## Power :-

1) $P = \frac{W}{t} = \frac{FS}{t} = \frac{FS\cos\theta}{t} \Rightarrow t = \frac{FS\cos\theta}{P} \Rightarrow W = P \times t$

2) $P = \frac{K.E}{t} \Rightarrow \frac{mv^2}{2t} \Rightarrow \frac{PV}{2t}$ ; $\frac{P^2}{2t/m}$ ; $\cancel{K = \sqrt{2m}}$

3) $P = \frac{P.E}{t} \Rightarrow \frac{mgh}{t} \Rightarrow \frac{wh}{t} \Rightarrow wV$ $\because w = mg$

4) $P = F.V \Rightarrow FV\cos\theta$

For Rotatory

$P = \tau\omega$ $\omega$ = omega

$P = \tau 2\pi f$

$P = \frac{\tau 2\pi}{T}$

$P = (r \times F) 2\pi f$

$P = FCf$ ; $C = 2\pi r$

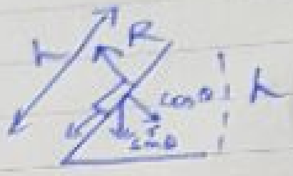
Date

## FOR FRICTIONLESS INCLINED PLANE:-

$P = wV\sin\theta$

$P = mgV\sin\theta$

$P = mgV\left(\frac{h}{l}\right)$




# Scalars & Vectors
## Chap # 02

Addition of Rectangular Components:-

$R = \sqrt{(F_{1x}\cos\theta_1 + F_{2x}\cos\theta_2)^2 + (F_{1y}\sin\theta_1 + F_{2y}\sin\theta_2)^2}$

Analytical method:-

$R = \sqrt{A^2 + B^2 \pm 2AB\cos\theta}$

$\frac{A}{\sin\alpha} = \frac{B}{\sin\beta} = \frac{\alpha}{\sin\alpha}$ for direction

$\theta = \tan^{-1}\frac{F_y}{F_x}$ for direction

$F = \sqrt{F_x^2 + F_y^2 + F_z^2}$ for magnitude

ANE:-

Scalar product:-

$A.B = AB\cos\theta$

Vector Product:-

$\vec{A}\times\vec{B} = ABSin\theta$

# Geometrical Optics

# Chap # 10

Lens formula:-

$$\frac{1}{f} = \frac{1}{P} + \frac{1}{q}$$

Compound microscope:-

$L = q_0 + P_e$

$$M = \frac{L}{f_0}\left(1 + \frac{d}{f_e}\right)$$

Simple Microscope:-

$$M = 1 + \frac{d}{f}$$

$$M = \frac{\beta}{\alpha}$$

Astronomical telescope:-

$L = f_0 + f_e$

$$M = \frac{f_0}{F_e}$$

Power of the lens:-

$P = \frac{1}{f}$ (diopter in meter only)

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$f = \frac{f_1 \times f_2}{f_1 + f_2}$$

(combination of focal length)

- ★ Convex lens → Converging +ve focal length
- ★ Concave lens → Diverging -ve focal length
- ★ Convex mirror → Diverging -ve focal length
- ★ Concave mirror → converging +ve focal length

Date

# Fundamental Concepts of Physics:-

Book Reading only
NTS vise are 15 three blanks
comes alternate

## GEOMETRICAL OPTICS

Chap #10

Lens formula:-

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

$$\Rightarrow f = \frac{pq}{p+q}$$

$$\Rightarrow p = \frac{qf}{q-f}$$

$$\Rightarrow q = \frac{pf}{p-f}$$

Power of lens:-

$$\Rightarrow P = \frac{1}{f(m)}$$

$$\Rightarrow P = \frac{100}{f(cm)}$$

$$\Rightarrow P = \frac{1000}{f(mm)}$$

$$\Rightarrow P = \frac{p+q}{pq}$$ (all in meter)

$$\Rightarrow P = \frac{p+q}{pq} \times 100$$ (cm)

$$\Rightarrow P = \frac{p+q}{pq} \times 1000$$ (mm)

Combination of len

$P = P_1 + P_2$

$\Rightarrow \frac{1}{F} = \frac{1}{F_1}$

$\Rightarrow f = \frac{f_1 f_2}{f_1 +}$

$\Rightarrow f_1 =$

$\Rightarrow f_2$

$\Rightarrow$

Compound m

$\Rightarrow m = \frac{q_1}{p_1}($

$\Rightarrow m = \frac{f_1}{p_1 -}$

$\Rightarrow m =$

Magnific

$m =$

$P =$

No

In od

In eve

## Combination of lenses :-

$$P = P_1 + P_2$$

$$\Rightarrow \frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\Rightarrow f = \frac{f_1 f_2}{f_1 + f_2}$$

$$\Rightarrow f_1 = \frac{f_2 f}{f_2 - f}$$

$$\Rightarrow f_2 = \frac{f_1 f}{f_1 - f}$$

$$\Rightarrow P = \frac{f_1 + f_2}{f_1 f_2} \times 100 \, (cm)$$

## Compound microscope :-

$$\Rightarrow m = \frac{q_1}{p_1}\left(1 + \frac{d}{f_2}\right)$$

$$\rightarrow m = \frac{f_1}{p_1 - f_1}\left(1 + \frac{d}{f_2}\right)$$

$$\rightarrow m = \frac{q_1 - f_1}{f_1}\left(1 + \frac{d}{f_2}\right)$$

Book formula based on approximation

## Magnification :-

$$m = 1 + d/f$$

$$P = (m - 1) \times 4$$

## No. of Images :-

In odd $= \frac{360}{\theta}$

In even :- $\frac{360}{\theta} = \text{even} - 1$

## Refractive Index :

$$n = \frac{c}{v}$$

$$n_1 v_1 = n_2 v_2$$

$$n_1 \lambda_1 = n_2 \lambda_2$$

Tube length for astronomical telescope:-

$L = f_o + f_e$

Tube length for Compound microscope

$L = q_o + P_e$

## Chap # 03
## Force & motion

Tension in a String:-

Case-I :-

When both the body hanging vertically

$$a = \frac{(m_1 - m_2)}{m_1 + m_2} g$$

$$T = \frac{2 m_1 m_2}{m_1 + m_2} \times g$$

Case-II :-

When one body hang vertically & other is placed on a smooth horizontal surface

$$a = \frac{m_1}{m_1 + m_2} \times g$$

$$T = \frac{m_1 m_2}{m_1 + m_2} g$$

Law of conservation of linear momentum

$P = mV$

$$m_1 U_1 + m_2 U_2 = m_1 V_1 + m_2 V_2$$

Recoil velocity of gun :-

$m_1 V_1 + m_2 V_2 = 0$

Initial velocity of bullet :-

$$V = \sqrt{2gh}$$

Date

Tension in Vertical Circle at top:-

$$T = m\left(\frac{v^2}{r} - g\right) \quad (\text{minimum})$$

Tension in Vertical Circle at bottom:-

$$T = m\left(\frac{v^2}{r} + g\right) \quad (\text{maximum})$$

Elastic Collision In One Dimension:-

$$V_1 = \frac{(m_1 - m_2)}{m_1 + m_2} U_1 + \frac{2m_2 U_2}{m_1 + m_2}$$

$$V_2 = \frac{2m_1 U_1}{m_1 + m_2} + \frac{(m_2 - m_1) U_2}{m_1 + m_2}$$

Inclined plane:-

At rest:-

$$F = w\sin\theta$$

At downward:-

$$F = w\sin\theta - f$$

If frictionless:-

$$a = g\sin\theta$$

$$a = g\left(\frac{h}{L}\right)$$

$$\text{Average Speed} = \frac{\text{Total distance}}{\text{Total time}} = \boxed{\frac{2V_1V_2}{V_1 + V_2}}$$

Speed same ; Distance Different

$$S = \frac{V_1 + V_2}{2}$$

Date

↑ or ↓ in K.E = $(P^2 - 1) \times 100$

↑ or ↓ in $\vec{P}$(momentum) = $(\sqrt{k} - 1) \times 100$

If increase 100 may say plus (+)
If decrease 100 may minus (−)

x———x———x

$S_n = V_i + \frac{a}{2}(2n - 1)$ (not for total distance)

$S = \frac{1}{2} at^2$ (for total distance)

x———x

Chap # 08
Wave & Sand

Frequency:-

$f = \frac{1}{T}$

Time period of projection:-

$T = \frac{2\pi}{\omega}$

Time period of simple pendulum:-

$T = 2\pi \sqrt{\frac{L}{g}}$

Time period of spring mass system:-

$T = 2\pi \sqrt{\frac{m}{k}}$

+)

)

total distance)

)

K.E for an Oscillating System:-

$$K.E = \frac{1}{2}K(x_0^2 - x^2)$$

P.E for an Oscillating System:-

$$\text{Elastic } P.E = \frac{1}{2}Kx^2$$

Total Energy:-

$$E = \frac{1}{2}Kx_0^2$$

$x_0$ = amplitude

Simple Harmonic Motion:-

$$a = -\frac{K}{m}x$$

Simple pendulum:-

$$a = -\frac{g}{L}x$$

First Harmonics:-

$$f_1 = \frac{V}{2L}$$

2nd Harmonics:-

$$f_2 = 2f_1$$

nth Harmonics:-

$$f_n = nf_1$$

Velocity of transverse wave in String:-

$$V = \sqrt{\frac{F}{\mu}}$$

$$V = \sqrt{\frac{F \times l}{m}}$$

$$V = \sqrt{\frac{T \times l}{m}}$$

$$V = \sqrt{\frac{mg \times l}{m}}$$

Date

Speed of Sound :-

$$V = \sqrt{\frac{\gamma P}{\rho}}$$

Temperature in speed of Sound

$$\frac{V_1}{V_2} = \sqrt{\frac{T_1}{T_2}}$$

Intensity of Sound :-

$$I = \frac{E}{At}$$

Webe - Fetchner's law :-

$$L = k \log I$$

Intensity level :-

$$B = k \log \frac{I}{I_0}$$

Dopler's effect :-

Case I (a) :-

When Source is moving towards stationary listner :-

$$f' = \frac{V}{(V - V_s)} f$$

Case I (b) :-

When Source is moving away from stationary listener :-

$$f' = \frac{V}{(V + V_s)} f$$

Case II (a)
When
Stationary
f

Case II (b)
When
Stationary

Case (III) :- Sc
m

Case (IV)

Date

mal:-

Case II(a)

When listener is moving towards Stationary Source :-

$$f' = \left(\frac{V + V_L}{V}\right) f$$

Case II(b) :-

When listener is moving away from Stationary listener :-

$$f' = \left(\frac{V - V_L}{V}\right) f$$

Case (III) :- Source of Source & listener both are moving towards each other :-

$$f' = \left(\frac{V + V_L}{V - V_S}\right) f$$

Case (IV) Both are moving away from each other :-

$$f' = \left(\frac{V - V_L}{V + V_S}\right)$$

# XII - Current & Electricity

$\boxed{R = \frac{\rho L}{A}}$ length/area

$\boxed{R = \frac{\rho L^2}{V}}$ length

$\boxed{R = \frac{\rho V}{A^2}}$ Area

for current

$I = \frac{\text{Power output}}{\text{Efficiency} \times \text{volt}}$

Case - I :-

Relation b/w Resistance & length

$R' = (L^2)R$

Area = $\pi r^2$ ; $\pi d^2/4$

Case - II :-

Relation b/w Resistance & Area :- (radius or diameter)

$R' = \left(\frac{1}{r^4}\right)R$

Case - III :-

Relation of Resistance, length, area (radius or diameter) :-

$R' = \left(\frac{L}{r^2}\right)R$

Case - IV :-

$Re = R/n^2$ {In Parallel}

Case - V :-

$Re = nR$ {In Series}

FOR PARALLEL TO SERIES :-

$\frac{R_P}{R_S} = \frac{1}{n^2}$

FOR SERIES TO PARALLEL :-

$\frac{R_S}{R_P} = \frac{n^2}{1}$

% change in Resistance :-

$\% \Delta R = 2L$

Area / thinner :-

$\% \Delta R = -4r$

Electric current :-

1) $I = q/t$

2) $I = ne/t$ $q = ne$

3) $n = I \times t/e$

4) $n/t = I/e$

for circular condition

$I = qf$

P.d or Voltage :-

$V = W/q$

Drift Velocity :-

$V_d = \frac{I}{nAe}$

$n$ = no. of free $\bar{e}$

Ohm's law:-
$V = IR$ ; $R = V/I$

Parallel Circuit:-
$R_e = \frac{R_1 \times R_2}{R_1 + R_2}$ ; $R_e < R_1 ; R_2$ voltage = constant
current = change

Series Circuit:-
$R_e = R_1 + R_2 + R_3$ voltage = change
$R_e > R_1 ; R_2 ; R_3$ current = constant

For Voltage:-
$V_1 = \frac{R_1}{R_t} \times V_t$ $R_t$ = total resistance
$V_t$ = total voltage

Equal resistor:- (for voltage)
$V = \frac{V_t}{\text{Number of Resistor}}$

Emf:-
$V = \mathcal{E} - Ir$ using $\mathcal{E}$ greater
$V = \mathcal{E} + Ir$ charging $V$ = greater
$V = \mathcal{E}$ (current 0)

Power:-
1) $P = \frac{W}{t}$
2) $P = \frac{Vq}{t}$ ; $W = qV$
3) $P = VI$
4) $P = I^2R$
5) $P = V^2/R$

In ~~Se~~ Parallel Circuit:-
$\frac{R_1}{R_2} = \frac{P_2}{P_1}$ ; $P \propto \frac{1}{R}$
Equivalent Power In Parallel Ci
$P_e = P_1 + P_2$
Equivalent Power In Series Ci
$P_e = \frac{P_1 \times P_2}{P_1 + P_2}$

Relation b/w Resistance & Power:-
In Series Circuit:-
$P \propto R$
$\frac{R_1}{R_2} = \frac{P_1}{P_2}$

$$\boxed{R' = \frac{R}{360} \times \theta}$$
for wire resistance in circle

for thermocouple
$I = \frac{V_t}{R_t} \times \Delta T$

Chapt # 5

Electromechanical Instrument

$BINA = C\theta$

$I = \frac{C\theta}{BNA}$

Ammeter:-

$R_s = \frac{I_g R_g}{I - I_g}$ ; $I > I_g$

Voltmeter:-

$R_x = \frac{V}{I_g} - R_g$ ; $V > V_g$

Wheatstone Bridge :

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

Meter Bridge:-

$\frac{X}{R} = \frac{l_x}{l_R}$

Potentiometer:-

$\boxed{\frac{E_1}{E_2} = \frac{l_1}{l_2}}$ $l_1 > l_2$

$\boxed{\frac{E_1 + E_2}{E_1 - E_2} = \frac{l_1}{l_2}}$

$\boxed{r = \left(\frac{l_1}{l_2} - 1\right) R}$

Chap # 12

# The Atomic Spectra

1) Angular Momentum:-

$mvr = \frac{nh}{2\pi}$

$L = n\hbar$ $\quad \because \hbar = h/2\pi = 1.05 \times 10^{-34} J.s$

P.E of Electron:-

$P.E = \frac{-e^2}{4\pi \epsilon_0 r}$

K.E of Electron:-

$K.E = \frac{e^2}{8\pi \epsilon_0 r}$

$T.E = K.E + P.E$

$T.E = \frac{-e^2}{8\pi \epsilon_0 r}$

$\boxed{E_n = \frac{-me^4}{32\pi^2 \epsilon_0^2 \hbar^2 n^2}}$

$\boxed{E_n = \frac{-13.6eV}{n^2}}$

Radius:-

$r_n = \frac{4\pi \epsilon_0 \hbar^2 n^2}{me^2}$

$r_n = (0.53 \times 10^{-10}) n^2$ meter

$r_n = (0.53)n^2$ OA (amstrong)

$r_n = (0.053) n^2$ nano meter

frequency:-

$\nu = \frac{c}{\lambda}$

Wavelength:-

$\frac{1}{\lambda} = R_H \left( \frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$

$R_H = 1.1 \times 10^7 m^{-1}$

ENERGY :-

$E = h\nu$

$\nu = \frac{c}{\lambda}$

$E = \frac{hc}{\lambda}$

$E = Ve$ $\quad \because$ voltage = V

$Ve = \frac{hc}{\lambda}$

Chap # 11

# Heat & Thermodynamics

Temperature in Fahrenheit Scale:-

$$\frac{T_C - 0}{100} = \frac{T_F - 32}{180}$$

Temperature in Kelvin Scale:-

$$\frac{T_F - 32}{180} = \frac{T_K - 273}{100}$$

Linear Expansion:-

$$\Delta L = \alpha L_1 \Delta T$$

$$L_2 = L_1(1 + \alpha \Delta T)$$

Volumetric Expansion:-

$$\Delta V = \beta V_1 \Delta T$$

$$\beta = 3\alpha$$

General Gas Equation:-

$PV = nRT$ $\quad \because R = 8.314$ J/mole · k

Boltzman's Constant :-

$k = \frac{R}{N_A}$ $\quad \because R = 1$ mole

$\quad k = 1$ molecule

Pressure, Velocity & mean Square Velocity

$$P = 1/3\, \rho \bar{v}^2$$

$$\bar{v}^2 = \frac{3P}{\rho}$$

$$v_{rms} = \sqrt{\frac{3P}{\rho}}$$

Kinetic Energy:-

$(K.E)_{max} = 3/2\ KT$

First law of Thermodynamics :-

$\Delta Q = \Delta U + \Delta W$

Isobaric Process:-

$\Delta U = \Delta Q - P\Delta W \qquad \Delta W = P\Delta V$

$U_f - U_i = \Delta Q - P(V_f - V_i)$

Isochoric Process :-

$\Delta U = \Delta Q$

Adiabatic Process:-

$\cancel{\Delta Q = P\Delta V} \qquad \Delta U = -\Delta W$

Isothermal Process:-

$\Delta Q = P\Delta V$

Entropy:-

$\Delta S = \pm \frac{\Delta Q}{T}$

Specific heat Capacity:-

$Q = mC\Delta T$

Molar Specific heat:-

$Q = nC_m\Delta T$

Efficiency of engine :-

$\eta = \frac{\Delta W}{Q_1} \times 100 \quad \because \quad \Delta W = Q_1 - Q_2$

$\eta = \left(1 - \frac{Q_2}{Q_1}\right) \times 100$

$\eta = \left(1 - \frac{T_2}{T_1}\right) \times 100$

Chap # 12

# ELECTROSTATIC

Coulomb's law :-

$$F_e = k\frac{q_1 q_2}{r^2}$$

Electrostatic force :-

$$F_e = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r^2} \quad \because k = \frac{1}{4\pi\epsilon_0} = 9\times10^9\ Nm^2/C^2$$

$$F_e' = \frac{1}{4\pi\epsilon_r\epsilon_0}\frac{q_1 q_2}{r^2}$$

$q = Ne$ (charge on a body)

Electric field Intensity :-

$$\vec{E} = \frac{\vec{F_e}}{q_0}$$

$$\vec{E} = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}\hat{r}$$

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

Electric flux :-

$$\phi_e = \frac{1}{\epsilon_0}\times q$$

Electric Intensity due to large sheet of charge :-

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

Electric Intensity due to spherical shell of charge

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

Date

Electric Intensity due to sheet of opposite charges

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

Electric potential Energy :-

$$\Delta U = -q_0 E \Delta r$$

Electric potential :-

$$E = -\frac{\Delta V}{\Delta r}$$

Potential Gradient :-

$$\Delta V = E \cdot \Delta r$$

Capacitor :-

$$q = CV$$

$$C = \frac{A\epsilon_0}{d}$$

$$C' = \frac{A\epsilon_r\epsilon_0}{d}$$

Parallel Combination :-

$$C_e = C_1 + C_2 + C_3 - - - - + C_N$$

Series Combination :-

$$\frac{1}{C_e} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + - - - - + \frac{1}{C_N}$$

ic charges

# Chap #14

## Magnetism & Electromagnetism

Force on a moving charge in magnetic field:-

$$q = \frac{mv^2}{rB\sin\theta}$$

Force on a current carrying coil:

$$F = ILB\sin\theta$$

Torque on a current carrying coil:

$$\tau = BINA$$

$$\tau = BINA\cos\theta$$

$\frac{e}{m}$ ratio of electron:-

$$\frac{e}{m} = \frac{v}{Br}$$

Radius of Circular path:-

$$r = \frac{b^2}{2d}$$

Velocity of Electron:-

$$\frac{e}{m} = \frac{8d^2V}{B^2b^4} \quad \because \; v = \sqrt{\frac{2eV}{m}} \rightarrow \text{voltage}$$

$$\frac{e}{m} = \frac{2Ed}{B^2b^2} \quad \because \; v = \frac{E}{B}$$

Biot-Sewart law:-

$$B = \frac{\mu_o I}{2\pi r}$$

$$B = \frac{\mu_r \mu_o I}{2\pi r}$$

Ampere's law:-

$$\Sigma(\vec{B} \cdot \vec{\Delta l}) = \mu_o \times I$$

Solenoid:-

$$B = \mu_o n I$$

Toroid:-

$$B = \frac{\mu_o N I}{2\pi r}$$

Motional Emf:

$\mathcal{E} = -vBL$

Self Induction:-

$$L = \frac{N\phi_B}{I}$$

Mutual Induction:-

$$M = \frac{N_s \Delta\phi_B}{\Delta I_p}$$

Transformer:-

$$\frac{\mathcal{E}_s}{\mathcal{E}_p} = \left(\frac{N_s}{N_p}\right)$$

$$I_s = \left(\frac{N_p}{N_s}\right) I_p$$

A.C generator:-

$$\mathcal{E} = NWAB\ \sin\theta$$

$$\mathcal{E} = \mathcal{E}_{max} = NWAB$$

$$\mathcal{E} = \mathcal{E}_{max} \sin\theta$$

$$\mathcal{E} = N(2\pi f)\ AB \sin\omega t$$

Chap # 17

# ADVENT OF MODERN PHYSICS

**Work function :-**

$$\phi_o = h\nu_o$$

**Stopping potential :-**

$$V_o e = (K.E)_{max}$$

**Einstein's Photoelectric Equation :-**

$$V_o e = hc\left(\frac{1}{\lambda} - \frac{1}{\lambda_c}\right)$$

**Compton's Effect :-**

$$\Delta\lambda = \frac{h}{m_o c}(1-\cos\theta)$$

**De-Broglie Hypothesis :-**

$$\lambda = \frac{h}{mv}$$

**Pair Production :-**

$$h\nu = 2m_oc^2 + (K.E)_{e^+} + (K.E)_{e^-}$$

**Anihilation :-**

$$2m_oc^2 + (K.E)_{e^-} + (K.E)_{e^+} = 2h\nu$$

1) Time dilation :-

$$t = \frac{t_o}{\sqrt{1-v^2/c^2}}$$

2) length Contraction :-

$$l = l_o\sqrt{1-v^2/c^2}$$

3) mass variation :-

$$m = \frac{m_o}{\sqrt{1-v^2/c^2}}$$

4) mass-Energy Equivalence

$$E = mc^2$$

Chap # 19

# Atomic Nucleus

Radioactive Decay law :-

$$N = N_o e^{-\lambda t}$$

$$\Delta N = -\lambda N_o \Delta t$$

Activity :-

$$A = \lambda N$$

Mass Defect :-

$$\Delta m = \{Zm_p + (A-Z)m_n\} - m$$

Packing fraction :-

$$P.F = \frac{\Delta m}{A}$$

Binding Energy :-

$$B.E = (\Delta m)c^2$$

$$B.E = (\Delta m) 931 \text{ Mev}$$

Binding fraction :-

$$B.F = \frac{B.E}{A}$$

Chap # 20

Date

# Atomic Radiation

Book Reading Only

One to three mcqs comes alternate year