FORMULAE

unit - 1 Laws of motion.

1) Linear momentum $p = mv$

2) parallel forces are acting in the same direction $F_{net} = F_1 + F_2$

3) parallel forces are acting in the opposite directions.
$F_{net} = F_1 - F_2$ (if $F_1 > F_2$)
$F_{net} = F_2 - F_1$ (if $F_2 > F_1$)

4) Torque $\tau = F \times d$

5) principle of moments $F_1 \times d_1 = F_2 \times d_2$

6) Moment of Couple $M = F \times S$.

7) Force $F = ma$

8) Impulse $J = \Delta p$
(or)
$J = F \times t$

9) Law of Conservation of linear momentum $m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2$

10) Newton's Universal law of gravitation $F = \frac{G m_1 m_2}{r^2}$
($G = 6.674 \times 10^{-11} Nm^2kg^{-2}$)

11) Acceleration due to gravity $g = \frac{GM}{R^2}$

12) Weight $W = mg$

13) Mass of the Earth $M = \frac{gR^2}{G}$

14. Acceleration $a = \frac{v - u}{t}$.

2. OPTICS

1)	velocity of light	$c = \nu\lambda$
2)	Snell's law	$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$
3)	Rayleigh's scattering law.	$S \propto \frac{1}{\lambda^4}$
4)	Lens formula	$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
5)	Magnification	$m = \frac{h'}{h} = \frac{v}{u}$ = distance of image / distance of object
6)	power of lens	$P = \frac{1}{f}$
7)	Refractive index	$\mu = \frac{c}{v}$
8)	Lens maker's formula	$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$
9)	Focal length (myopia)	$f = \frac{xy}{x-y}$
10)	Focal length (hypermetropia)	$f = \frac{dD}{}$

3. THERMAL PHYSICS.

1)	Relation b/w celsius and kelvin	$K = {}^{\circ}C + 273$
2)	Relation b/w Fahrenheit and kelvin	$[K] = (F + 460) \times \frac{5}{9}$
3)	Coefficient of linear expansion	$\frac{\Delta L}{L_0} = \alpha_L \Delta T$
4)	Coefficient of areal expansion.	$\frac{\Delta A}{A_0} = \alpha_A \Delta T$
5)	Coefficient of cubical expansion	$\frac{\Delta V}{V_0} = \alpha_V \Delta T$
6)	Boyle's law	$P \propto \frac{1}{V}$ (or) $PV = \text{Constant}$
7)	Charle's law.	$V \propto T$ (or) $\frac{V}{T} = \text{Const}$
8)	Avogadro's law	$V \propto n$ (or) $\frac{V}{n} = \text{Const}$
9)	Ideal gas equation	$PV = nRT$

where,
R - universal gas constant

$R = 8.31\ J\,mol^{-1}K$

Unit – 4 Electricity

1) Electric current $I = \frac{Q}{t} = \frac{\text{charge}}{\text{time}}$

2) Potential difference $V = \frac{W}{Q} = \frac{\text{Workdone}}{\text{charge}}$

3) Ohm's law $V = IR$

4) Electrical resistivity (or) specific resistance $\rho = \frac{RA}{L}$

5) Conductance $G = \frac{1}{R} = \frac{1}{\text{resistance}}$

6) Conductivity $\sigma = \frac{1}{\rho} = \frac{1}{\text{resistivity}}$

7) Equivalent resistance in a series Combinations $R_S = R_1 + R_2$

8) When 'n' resistors are Connected in a series Combinations. $R_S = nR$

9) When 'n' resistors are connected in parallel $R_P = \frac{R}{n}$

10) Equivalent resistance in a parallel combinations $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

11) Series connection of parallel resistors $R_{total} = R_{P1} + R_{P2}$

12) Parallel connection of series resistors $\frac{1}{R_{total}} = \frac{1}{R_{S1}} + \frac{1}{R_{S2}}$

13) Joule's law of heating $H = I^2Rt$ (or) $H = VIt$

13) Electric power $P = \frac{\text{Work}}{\text{time}} = \frac{VIt}{t}$ (or) $P = VI = \frac{V^2}{R} = I^2R$

14) Electrical energy $E = \text{power} \times \text{time} = VIt = VQ = pxt.$

15) Resistance $\text{Resistance}(R) = \frac{\text{Voltage}(V)}{\text{current}(I)}$

5. ACOUSTICS

1) Effect of density

$$V \propto \sqrt{\frac{1}{d}}$$

2) Effect of temperature

$$V_T = (V_0 + 0.61T)\ ms^{-1}$$

(or)

$$V \propto \sqrt{T}$$

3) Speed of sound

$$= \frac{2d}{t} = \frac{\text{Distance travelled}}{\text{time taken}}$$

4) Velocity

$$V = \frac{\text{Distance travelled by sound}}{\text{time taken}} = \frac{2d}{t}$$

5) Source and listener move towards each other

$$n' = \left(\frac{v + v_L}{v - v_s}\right) n$$

6) Source and listener move away from each other

$$n' = \left(\frac{v - v_L}{v + v_s}\right) n$$

7) Listener move towards the stationary source

$$n' = \left(\frac{v + v_L}{v}\right) n$$

8) Listener move away from the stationary source

$$n' = \left(\frac{v - v_L}{v}\right) n$$

9) Source move towards stationary listener

$$n' = \left(\frac{v}{v - v_s}\right) n$$

10) Source move away from stationary listener

$$n' = \left(\frac{v}{v + v_s}\right) n$$

11) Frequency

$$n = \frac{1}{\text{Time period (T)}}$$

12) Wavelength

$$\lambda = \frac{\text{Velocity of sound (v)}}{\text{frequency (n)}}$$

13) Time period

$$T = \frac{1}{\text{frequency (n)}}$$

14) Velocity (of a wave) (or) Wave velocity

$$V = \lambda \times \frac{1}{T}$$

$$V = \lambda n$$

15) Intensity of sound

$$I = \frac{\text{Work (W)}}{\text{Area (A)} \times \text{time (t)}}$$

$$I = \frac{\text{Power (P)}}{\text{Area (A)}}$$

6. NUCLEAR PHYSICS

Unit.

1) curie - 1 curie = 3.7×10^{10} disintegration per second.

2) Rutherford (Rd) - The quantity of a radioactive substance, which produces 10^6 disintegrations in one second.

3) Becquerel - The SI unit of radioactivity is Becquerel. (It is defined as the quantity of one disintegration per second)

4) Roentgen - The quantity of radioactive substance which produces a charge of 2.58×10^{-4} coulomb in 1kg of air under standard conditions of Pressure, temperature and

7. ATOMS AND MOLECULES.

① Relative Atomic mass (RAM) = A_r = Average mass of the isotopes of the elemen / $\frac{1}{12^{th}}$ mass of one carbon-1

② Relative molecular mass (RMM) = Mass of one molecule of the substance / $\frac{1}{12^{th}}$ mass of an atom of C-

③ Number of moles = Mass / Atomic mass

= Mass / Molecular mass

= Number of Atoms / 6.023×10^{23}

= Number of molecules / 6.023×10^{23}

= Volume / Molar Volume

④ Mass % of an element

$$= \frac{\text{Mass of that element in the compound}}{\text{molar mass of compound}} \times 100$$

⑤ Atomicity $= \frac{\text{Molecular mass}}{\text{Atomic mass.}}$

⑥ Vapour density (V.D) $= \frac{\text{Mass of given volume of gas or vapour at S.T.P}}{\text{Mass of same volume of hydrogen.}}$

⑦ 2 × Vapour density = Relative molecular mass of a gas.

⑧ Atomic number (Z) = (Number of protons = Number of electrons)

⑨ Atomic mass (A) = Number of protons + Number of neutrons.

8. PERIODIC CLASSIFICATION OF ELEMENTS.

⑪ Metallic radius $= \frac{\text{Distance between the nuclei of adjacent metal atoms}}{2}$

② Covalent radius $= \frac{\text{Distance between the adjacent nuclei of two covalently bonded atoms of the same element in a molecule}}{2.}$

Unit-9 SOLUTIONS.

① Solubility = $\frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$

② Mass percentage = $\frac{\text{Mass of the solute}}{\text{Mass of the solution}} \times 100$

③ Volume percentage = $\frac{\text{Volume of the solute}}{\text{Volume of the solute} + \text{Volume of Solvent}} \times 100$

Unit-10 TYPES OF CHEMICAL REACTIONS.

1. $pH = -\log_{10}[H^+]$
2. $pOH = -\log_{10}[OH^-]$
3. $pH + pOH = 14$

$K_W = [H_3O^+][OH^-] = 1 \times 10^{-14}\ mol^2 dm^{-6}$

$K_W = [H^+][OH^-] = 1 \times 10^{-14}\ mol\ dm^{-3}$

Unit-11 CARBON AND ITS COMPOUNDS

General formula for hydrocarbons.

Saturated - Alkanes - C_nH_{2n+2}

Unsaturated -

i) Alkenes - C_nH_{2n}

ii) Alkynes - C_nH_{2n-2}