

unit - 10

PH calculation

$$pH = -\log_{10} [H^+]$$

$$pOH = -\log_{10} [OH^-]$$

$$pH + pOH = 14$$

unit - 9 Solubility

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

$$\text{volume percentage} = \frac{\text{Volume of solute}}{\text{volume of solution}} \times 100$$

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

Atoms and moleculesNo of moles $\Rightarrow$

$$\Rightarrow \frac{\text{mass}}{\text{atomic mass}}$$

$$\Rightarrow \frac{\text{mass}}{\text{molecular mass}}$$

$$\Rightarrow \frac{\text{No of atom}}{6.023 \times 10^{23}}$$

$$\Rightarrow \frac{\text{no of molecules}}{6.023 \times 10^{23}}$$

Relative atomic mass -
(RAM)

$$\frac{\text{Average mass}}{\frac{1}{12} \text{th mass of 1 carbon atom}}$$

$$\text{mass \% of an element} = \frac{\text{mass of element}}{\text{molar mass}} \times 100$$

$$\text{Atomicity} = \frac{\text{molecular mass}}{\text{Atomic mass}}$$

$$\text{Atomic mass} = \text{no of proton} + \text{no of neutron}$$

Conductance

$$G = \frac{1}{R}$$

[Reciprocal of its resistance]
unit = ohm⁻¹ or mho

Conductivity

$$\sigma = \frac{1}{\rho}$$

unit = ohm⁻¹ metre⁻¹

Electrical resistivity

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

$$\rho = \frac{RA}{L}$$

Voltage

(ohm metre)

$$V = \frac{W}{Q}$$

unit - J (thermal energy)

Linear expansion - $\frac{\Delta L}{L_0} = \alpha_L \Delta T$

Areal expansion - $\frac{\Delta A}{A_0} = \alpha_A \Delta T$

Cubical expansion - $\frac{\Delta V}{V_0} = \alpha_V \Delta T$

} K⁻¹

Real expansion = $L_3 - L_2$

Apparent expansion = $L_3 - L_1$

Boyle's Law - $PV = \text{constant}$

Charles law - $\frac{V}{T} = \text{constant}$

Avagadro law - $\frac{V}{n} = \text{constant}$

Ideal gas equation
(or)
equation of state } $PV = RT$

Celsius and Kelvin $K = C + 273$

Fahrenheit and Kelvin $K = (F + 460) \times \frac{5}{9}$

unit - 2 (Optics)

Speed of light = $3 \times 10^8 \text{ m s}^{-1}$

Snell's Law = $\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$

Refractive index $\mu = \frac{c}{v}$

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Rayleigh Scattering
Law

$$S \propto \frac{1}{\lambda^4}$$

(λ = wavelength
S = amount of scattering)

lens formula :-

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

magnification

$$m = \frac{h'}{h}$$

where $\frac{h'}{h} = \frac{\text{height of the image}}{\text{height of the object}}$

$$m = \frac{v}{u}$$

where

$$\frac{v}{u} = \frac{\text{Distance of the image}}{\text{Distance of the object}}$$

magnification < 1 (enlarge) > 1 (enlarge) < 1 (diminished)Len's maker formula

$$\frac{1}{f} = \cancel{\mu} (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

Here,

 μ - refractive Index of the material R_1 and R_2 are radii of curvature of the two faces of the lens f - focal length of the lens.Power of the lens

$$P = \frac{1}{f} \quad \text{SI unit is Diopter (D)}$$

near point of the eye = 25 cm

far point of the eye = ∞ (Infinite)

focal length of myopia

$$f = \frac{xy}{x-y}$$

focal length of Hypermetropia

$$f = \frac{dD}{d-D}$$

Where, $D = 0.25 \text{ cm}$ (for normal eye)

Unit - 1 (Laws of motion)

Newton's Second Law,

$$F = ma$$

Here,

$F = \text{Force}$

$m = \text{mass}$

$a = \text{acceleration}$

1 Newton (1N)

$$1N = 1 \text{ kgms}^{-2}$$

1 dyne (1d)

$$1 \text{ dyne} = 1 \text{ g cm s}^{-2}$$

$$1N = 10^5 \text{ dyne}$$

Gravitational unit of force

$$1 \text{ kgf} = 1 \text{ kg} \times 9.8 \text{ ms}^{-2} = 9.8 \text{ N}$$

$$1 \text{ gf} = 1 \text{ g} \times 980 \text{ cm s}^{-2} = 980 \text{ dyne}$$

Impulse (J)

$$J = F \times t$$

Newton's IIIrd Law,

$$F_B = -F_A$$

Law of conservation of linear momentum,

$$m_1 v_1 + m_2 v_2 = m_1 v_1 + m_2 v_2$$

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sum of momentum before after collision
= sum of momentum before collision

Universal Law of Gravitation

$$F = \frac{G m_1 m_2}{r^2}$$

$$\text{CSI unit} = 6.674 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$$

Acceleration due to gravity

$$g = \frac{GM}{R^2}$$

Mass of the earth (M)

$$M = g R^2 / G$$

$$M = 5.972 \times 10^{24} \text{ kg}$$

Acceleration due to gravity on surface of the moon

$$1.625 \text{ m s}^{-2}$$

Lift moving upwards

$$R = m(g+a), R > w$$

Lift moving downwards

$$R = m(g-a), R < w$$

Lift at rest

$$R = mg$$

$$R = w$$

Lift falling down freely

$$R = m(g-g) = 0$$

Principles of moments

$$F_1 \times d_1 = F_2 \times d_2$$

moment in

clockwise direction =

moment in anti
clockwise directionmoment of couple

$$M = F \times S$$

SI unit = Nm (In SI)

CGS SI unit = dyne cm

(In CGS)

Here,

F = Force

S = Perpendicular distance between the
line of actions of forceMoment of force

$$\text{torque } (\tau) = F \times d$$

Vector quantity

SI unit = Nm

Linear momentum

$$P = mv$$

(mass x velocity)

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SI system = kg ms⁻¹C.G.S system = g cm s⁻¹

unit - 3 (Acoustics)

Velocity of sound in gas

$$V \propto \sqrt{\frac{1}{d}} \quad (d = \text{density})$$

$$V \propto \sqrt{T} \quad (T = \text{Temperature})$$

$$V_T = (V_0 + 0.61 T) \text{ m s}^{-1}$$

$$V = \frac{\text{Distance}}{\text{Time taken}} \quad (\text{once})$$

$$V = \frac{2d}{t} \quad (\text{reflected})$$

Minimum distance
to hear an echo = 17.2 m

Minimum Time = 0.1 s

Frequency

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

$$V = n\lambda$$

$$\lambda = \frac{V}{n}$$

$$n = \frac{V}{\lambda}$$

$$V = \frac{2d}{t}$$

Both source and
observer move
towards

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

away from

$$n' = \frac{V - V_L}{V + V_S}$$

unit -6

(nuclear physics)

$$E = mc^2$$



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