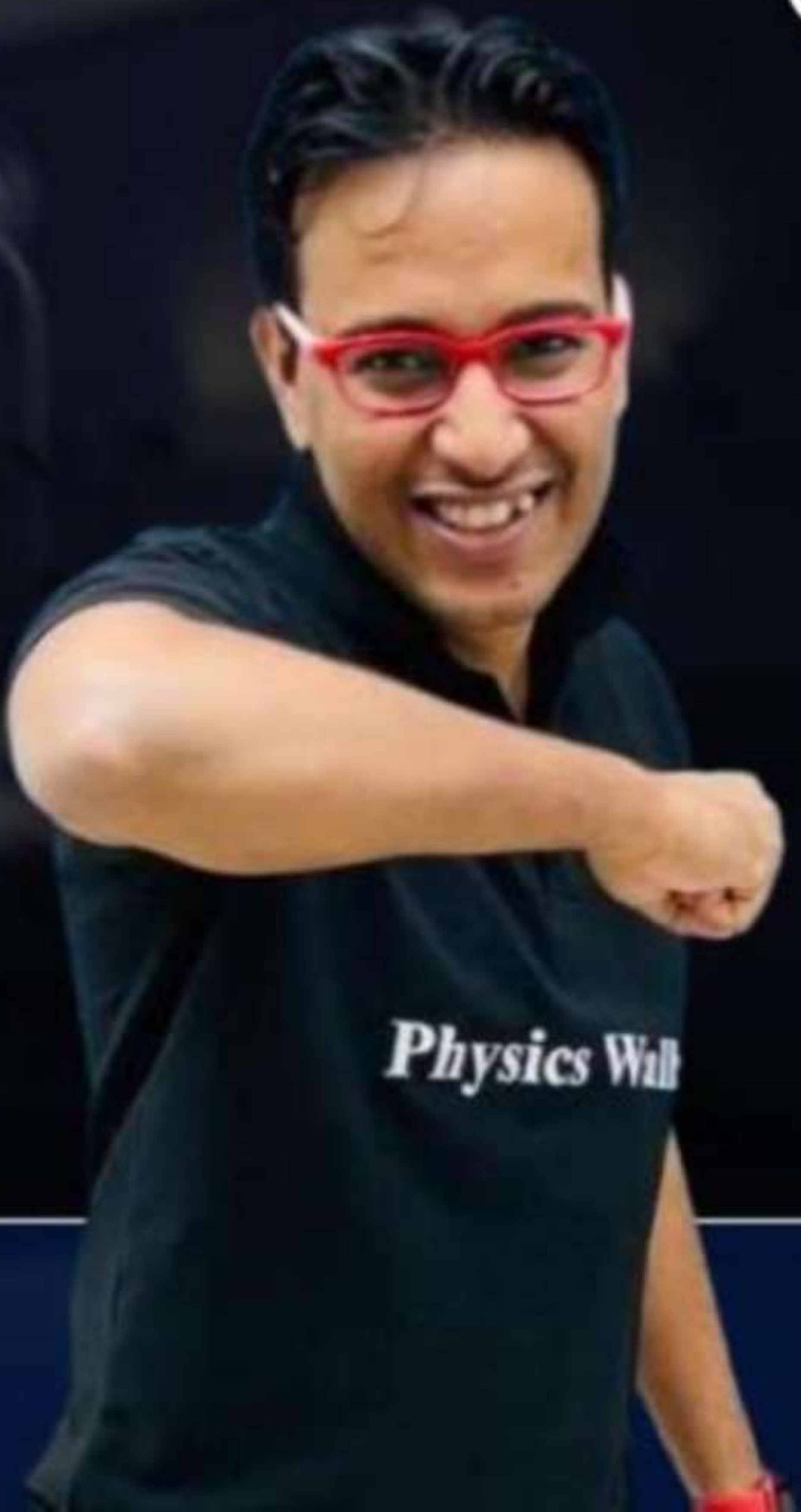
YAKEEN NEET 2.0

2026

Units and Measurements

PHYSICS | Lecture - 02

By - Saleem Ahmed Sir



Todays Goal

Dimension and dimensional formula

meter ✗

mass has dimension $[M]$

Length " " $[L]$

time " " $[T]$

Temp " " $[K]$

current " " $[A]$ or $[I]$

Amount of subst " $[mol]$

Lumunious Intensity $[cd]$

$$\text{Density} = \frac{\text{mass}}{\text{vol}^n} \Longrightarrow \frac{M}{L \times L \times L}$$

$$= [M^1 L^{-3} T^0]$$

$$= M L^{-3}$$

Dimension of mass in density $= 1$

Dimension of Length in density $= -3$

" time " " $= 0$

Area = Length x width $\longrightarrow$ $L \times L = L^2 \Rightarrow M^0 L^2 T^0$

Volume = Length x width x height $\longrightarrow$ $L \times L \times L = L^3 \Rightarrow M^0 L^3 T^0$

Density = $\frac{\text{mass}}{\text{Vol}^n}$ $\longrightarrow$ $\frac{M}{L^3} = M L^{-3} T^0$

Speed = $\frac{\text{Distance}}{\text{time}}$ $\longrightarrow$ $\frac{L}{T} = LT^{-1} = M^0 LT^{-1}$

Velocity = $\frac{\text{Displacement}}{\text{time}}$ $\longrightarrow$ $\frac{L}{T} = LT^{-1}$

Acc = $\frac{\text{Velocity}}{\text{time}}$ $\longrightarrow$ $\frac{LT^{-1}}{T} = LT^{-2}$

Force $(F = ma)$ $\longrightarrow$ $[MLT^{-2}]$

Acc. due to gravity (g) $\xrightarrow{g = 9.8\ m/s^2}$ LT^{-2}

momentum (P = mass × velocity) $\longrightarrow$ MLT^{-1}

Impulse (J = Force × time) $\longrightarrow$ $MLT^{-2} \cdot T = MLT^{-1}$

Work = Force × Displacement $\longrightarrow$ $MLT^{-2} \cdot L = ML^2T^{-2}$

Torque = Force × (perpendicular Distance) $\longrightarrow$ $MLT^{-2} \cdot L = ML^2T^{-2}$

Angular momentum $L = mvr$ $\longrightarrow$ $MLT^{-1} \cdot L = ML^2T^{-1}$

mass Velocity Distance

$$\text{Stress} = \frac{\text{Force}}{\text{Area}} \longrightarrow \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} \longrightarrow \text{" " "}$$

$$\text{Surface tension} = \frac{\text{Force}}{\text{Length}} \longrightarrow \frac{MLT^{-2}}{L} = ML^{0}T^{-2}$$

$$\text{strain} = \frac{\text{change in length}}{\text{original length}} \longrightarrow \frac{L}{L} = 1 = M^{0}L^{0}T^{0}$$ (Dimension less)

$$\text{Angle} = \frac{\text{arc length}}{\text{radius}} \longrightarrow \frac{L}{L} = 1$$ (Dimensionless), (unit rad)

$$\text{Kinetic Energy} = \frac{1}{2}mv^{2} \longrightarrow M(LT^{-1})^{2} = ML^{2}T^{-2}$$

$$\text{Potential energy} = mg\underbrace{h}_{\text{height}} \longrightarrow MLT^{-2}\cdot L = ML^{2}T^{-2}$$

$$\text{Frequency} = \frac{1}{\text{timeperiod}} \longrightarrow \frac{1}{T} = T^{-1}$$

$$\text{power} = \frac{\text{Work}}{\text{time}} \longrightarrow \frac{ML^{2}T^{-2}}{T} = ML^{2}T^{-3}$$

moment of inertia $\Rightarrow (I = mR^2) \longrightarrow ML^2$

Angular velocity $\Rightarrow \left(\frac{\text{Angle}}{\text{time}}\right) \longrightarrow \frac{1}{T} = T^{-1}$

Angular acc $\Rightarrow \left(\frac{\text{Angular Velocity}}{\text{time}}\right) \longrightarrow \frac{T^{-1}}{T} = T^{-2}$

Angular Impulse $\Rightarrow (\text{Torque} \times \text{time}) \longrightarrow ML^2T^{-2} \cdot T \equiv ML^2T^{-1}$

temp. gradient $\equiv \left(\frac{\text{Temp.}}{\text{length}}\right) \longrightarrow \frac{K}{L} \equiv KL^{-1}$

Rate of heat flow per sec. $\equiv \left(\frac{\text{heat energy}}{\text{time}}\right) \longrightarrow \frac{ML^2T^{-2}}{T} \equiv ML^2T^{-3}$

$\left(\frac{dQ}{dt}\right)$

$$\left\{\begin{array}{l} \text{acc} \longrightarrow LT^{-2} \\ \text{Fora} \longrightarrow MLT^{-2} \\ \text{Enegy} \longrightarrow ML^{2}T^{-2} \end{array}\right\}$$

Force → MLT^{-2}

magnetic force → MLT^{-2}

Nuclear force → MLT^{-2}

Electric force → MLT^{-2}

Lorentz force → MLT^{-2}

Centrifugal force → MLT^{-2}

Contact force → MLT^{-2}

Gravitational force → MLT^{-2}

Tension force → MLT^{-2}

Normal Force → MLT^{-2}

Friction → MLT^{-2}

Centripital force → MLT^{-2}

Psedo force → MLT^{-2}

Spring force → MLT^{-2}

Nalayak
EMF
electromotive
force

$\Downarrow$

~~Force MLT^{-2}~~

Spring P.E. Sound energy work fxn

work

Kinetic Energy

Torque

Potential Energy ML^2T^{-2} Vib. Energy

Electrost. P.E

mechanical Energy

Binding Energy

Energy of one photon

Heat energy Rotational K.E thermal energy

Imp. point

* अगर DF same है तो जरूरी नहीं कि phy. quant. भी Same हो

* All the dimensionless phy. quant. are unitless ⟶ False

* All the unitless phy. quant are dimensionless ⟶ yes

angle

Unit radian

Dimensionless

Kaddu.... कद्दू - -

* Kisi bhi phy. का DF yad Nahi karna hai... Ratta X
  jab tak mai Na Bolu... -
* Koi bhi formula ko yad karne का Load Nahi lena hai.
* In Unit & Dim.
  Kisi bhi quan की Language पर Bilkul dhyan Nahi Dena hai
* Kaun si phy. quan. क्या है - - - Mujhe matlab Nahi hai.

Q Find the D.F. of universal grav. Const. (G)

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

Force

Distance

mass

Sol^n

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

$$G = \frac{F r^2}{m_1 m_2} \Longrightarrow \frac{MLT^{-2} \cdot L^2}{MM} = M^{-1} L^3 T^{-2}$$

Q If D.F. of G is represented by $M^x L^y T^z$ then find

① $x+y+z$ ② $|x|+|y|+|z|$

$M^{-1} L^3 T^{-2}$

$x = -1$

$y = 3$

$z = -2$

① $x+y+z = 0$

② $|x|+|y|+|z|$

$= 1+3+2 = 6$

Stokes Law

Q $F = 6\pi r \eta v$

$F \rightarrow$ Force

$r \rightarrow$ radius

$\eta \rightarrow$ coff. of viscosity

$v \rightarrow$ speed

$$\eta = \frac{F}{6\pi r v}$$

$$\eta \Rightarrow \frac{MLT^{-2}}{L\,LT^{-1}} = ML^{-1}T^{-1}$$

Q $E = \frac{3}{2} K T$

Energy

temp

boltzman const

$$K = \frac{2}{3}\frac{E}{T}$$

$$K \Rightarrow \frac{ML^2T^{-2}}{K} \equiv ML^2T^{-2}K^{-1}$$

Q $\frac{F}{A} = Y \frac{\Delta l}{l}$

$F \rightarrow$ Force

$A \rightarrow$ Area

$\Delta l \rightarrow$ change in length

$l \rightarrow$ lenth.

$Y \rightarrow$ youngs modulu

$$Y = \frac{Fl}{A\,\Delta l} \Rightarrow \frac{MLT^{-2} \cdot L}{L^2 \cdot L}$$

$$= ML^{-1}T^{-2}$$

Dimensional Analysis (Fayda....)

(1) we can check correctness of any formula dimentionally.

(1) check if $F = \frac{mv^2}{r^3}$ is correct ?

D.F. of L.H.S. $\equiv$ Force $\equiv MLT^{-2}$

" " R.H.S $\equiv \frac{mv^2}{r^3} \Rightarrow \frac{M(LT^{-1})^2}{L^3} = ML^{-1}T^{-2}$

LHS $\neq$ R.H.S

Formula is wrong.

Q Check

$l \rightarrow$ length

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

(Correct)

time period of simple pendulum

LHS $\Rightarrow T$

RHS $\Rightarrow$ $2\pi\sqrt{\frac{l}{g}} \Rightarrow \sqrt{\frac{L}{LT^{-2}}} = T$

Q the orbital speed of a sattellite of mass m_1 is given by

$$v = \sqrt{\frac{G m_1 m_e}{r}}$$

speed

$m_1 \longrightarrow$ mass of sattellite

$m_e \longrightarrow$,, ,, earth

$r \longrightarrow$ Distance (radius)

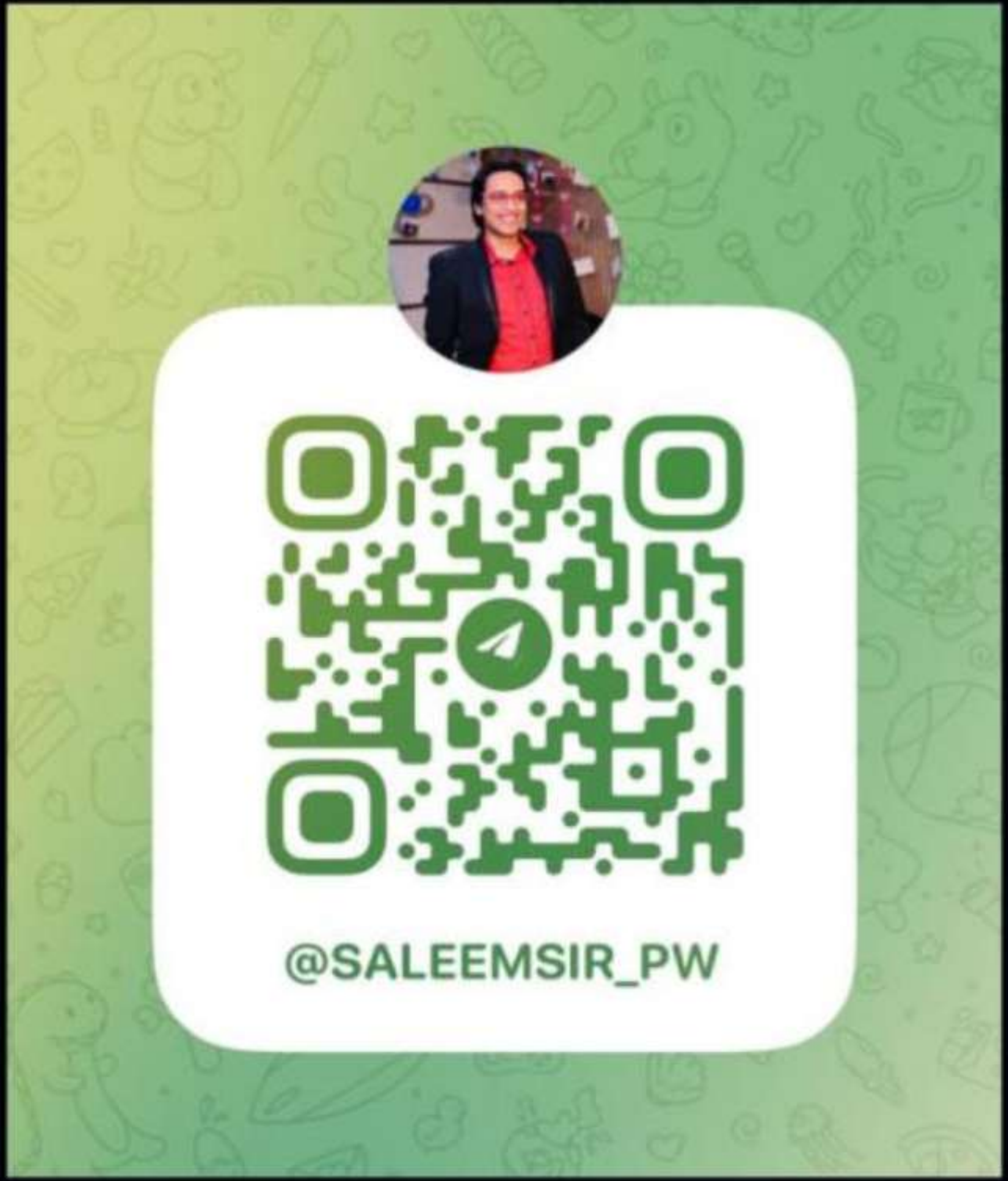
LHS $\Rightarrow LT^{-1}$

R.H.S $\Rightarrow \sqrt{\frac{M^{-1}L^3T^{-2} \cdot M \cdot M}{L}}$

$$\sqrt{L^2T^{-2}M}$$

LHS $\neq$ RHS

Wrong



Home work

- KPP (PYQ vector) solve if you havenot
- DPP
- HCV Vector → page 29

  3, 4, 5, 6, 10, 11, 13, 14, 15, 22, 23, 24, 25, 26, 29

THANK YOU