Physics

"Dimentional Equation"

Lecture 1

M → mass

L → Length

T → time

* Velocity $= \frac{x}{t} = \frac{L}{T} = LT^{-1}$
* Area $= L^2$
* acceleration $= \frac{v}{t} = \frac{LT^{-1}}{T} = LT^{-2}$
* Volume $= L^3$
* Force $= ma = MLT^{-2}$
* Density $= ML^{-3}$

$$V = V_0 + \frac{1}{2}at$$

- Dimentional equation of L.H.S. $= LT^{-1}$
- Dimentional equation of R.H.S. $= LT^{-1} + LT^{-2} \cdot T = LT^{-1} + LT^{-1} = LT^{-1}$

∴ D. equation of L.H.S. = D. equation of R.H.S

∴ The equation is Correct.

$$x = V_0t + \frac{1}{2}at^2$$

- Dimentional equation of L.H.S $= L$
- Dimentional equation of R.H.S $= \frac{L}{T} \cdot T + LT^{-2} \cdot T^2 = L + L = L$

∴ D. equation of L.H.S. = D. equation of R.H.S , ∴ The equation is Correct.

$V^2 = V_0^2 + 2ax^2$

- Dimentional equation of L.H.S. $= L^2T^{-2}$
- Dimentional equation of R.H.S. $= L^2T^{-2} + LT^{-2}L^2 = L^2T^{-2} + L^3T^{-2}$

$\therefore$ D. equation of L.H.S $\neq$ D. equation of R.H.S
$\therefore$ The equation isn't Correct

$y = Bx + Ct$

- if the equation is Correct, find B, C

- Dimentional equation of L.H.S. $= LT^{-1}$
- Dimentional equation of R.H.S. $= LB + CT$

$\therefore LT^{-1} = LB + CT \quad , \therefore B = T^{-1} \quad , C = LT^{-2}$

$T \propto m^x l^y g^z$

$\Rightarrow \quad T = \text{Const.}\ m^x l^y g^z$

$T = M^x L^y (LT^{-2})^z$

$T = M^x L^{y+z} T^{-2z}$

$\therefore M^0 L^0 T = M^x L^{y+z} T^{-2z}$

$\therefore -2z = 1 \quad , \therefore z = \frac{-1}{2}$

$, x = 0$

$, y + z = 0 \quad , \therefore y - \frac{1}{2} = 0 \quad , \therefore y = \frac{1}{2}$

$\therefore T = \text{Const.}\ l^{1/2} g^{-1/2}$

* Pressure $= \frac{F}{A} = \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$

$P \propto h^x f^y g^z$

$\Rightarrow P = \text{Const.}\ h^x f^y g^z$

$ML^{-1}T^{-2} = L^x \cdot \left(\frac{M}{L^3}\right)^y \cdot (LT^{-2})^z$

$ML^{-1}T^{-2} = (L)^{-3y+x+z}\ M^y\ T^{-2z}$

$ML^{-1}T^{-2} = (L)^{-3y+x+z}\ M^y\ T^{-2z}$

$\therefore -2z = -2 \rightarrow z = 1$

$\rightarrow y = 1$

$\therefore -3y + x + z = -1$

$-3 + x + 1 = -1 \Rightarrow x = 1$, $\boxed{P = \text{Const.}\ h f g}$

$P \propto F^x A^y$

$\Rightarrow P = \text{Const.}\ F^x A^y$

$ML^{-1}T^{-2} = (MLT^{-2})^x (L^2)^y$

$ML^{-1}T^{-2} = M^x L^{x+2y} T^{-2x}$

$\therefore x = 1$

$\therefore 2y + x = -1$, $\therefore 2y + 1 = -1$, $\therefore y = -1$

$\therefore \boxed{P = \text{Const.}\ F A^{-1}}$
