5. DIMENSIONAL FORMULA

It is an expression which shows how and which of the fundamental units are required to represent the unit of physical quantity.

Different quantities with units. symbol and dimensional formula,

Quantity	Symbol	Formula	S.I. Unit	D.F.
Displacement	s	—	Metre or m	M^0LT^0
Area	A	$\ell \times b$	$(Metre)^2$ or m^2	$M^0L^2T^0$
Volume	V	$\ell \times b \times h$	$(Metre)^3$ or m^3	$M^0L^3T^0$
Velocity	v	$v = \frac{\Delta s}{\Delta t}$	m/s	M^0LT^{-1}
Momentum	p	p = mv	kgm/s	MLT^{-1}
Acceleration	a	$a = \frac{\Delta v}{\Delta t}$	m/s^2	M^0LT^{-2}
Force	F	F = ma	Newton or N	MLT^{-2}
Impulse	–	$F \times t$	N.sec	MLT^{-1}
Work	W	F. d	N.m	ML^2T^{-2}
Energy	KE or U	$K.E. = \frac{1}{2}mv^2$ P.E. = mgh	Joule or J	ML^2T^{-2}
Power	P	$P = \frac{W}{t}$	watt or W	ML^2T^{-3}
Density	d	d = mass/volume	kg/m^3	$ML^{-3}T^0$

Pressure	P	$P = F/A$	Pascal or Pa	$ML^{-1}T^{-2}$
Torque	τ	$\tau = r \times F$	N.m.	$ML^{2}T^{-2}$
Angular displacement	θ	$\theta = \frac{arc}{radius}$	radian or rad	$M^0L^0T^0$
Angular velocity	ω	$\omega = \frac{\theta}{t}$	rad/sec	$M^0L^0T^{-1}$
Angular acceleration	α	$\alpha = \frac{\Delta\omega}{\Delta t}$	rad/sec^2	$M^0L^0T^{-2}$
Moment of Inertia	I	$I = mr^2$	kg-m^2	ML^2T^0
Angular momentum	J or L	$J = mvr$	$\frac{kgm^2}{s}$	ML^2T^{-1}
Frequency	ν or f	$f = \frac{1}{T}$	hertz or Hz	$M^0L^0T^{-1}$
Stress	—	F/A	N/m^2	$ML^{-1}T^{-2}$
Strain	—	$\frac{\Delta\ell}{\ell}; \frac{\Delta A}{A}; \frac{\Delta V}{V}$	—	$M^0L^0T^0$
Youngs modulus (Bulk modulus)	Y	$Y = \frac{F/A}{\Delta\ell/\ell}$	N/m^2	$ML^{-1}T^{-2}$
Surface tension	T	$\frac{F}{\ell}$ or $\frac{W}{A}$	$\frac{N}{m}; \frac{J}{m^2}$	ML^0T^{-2}
Force constant (spring)	k	$F = kx$	N/m	ML^0T^{-2}
Coefficient of viscosity	η	$F = \eta\left(\frac{dv}{dx}\right)A$	kg/ms(poise in C.G.S)	$ML^{-1}T^{-1}$
Gravitational constant	G	$F = \frac{Gm_1m_2}{r^2}$ $\Rightarrow G = \frac{Fr^2}{m_1m_2}$	$\frac{N-m^2}{kg^2}$	$M^{-1}L^3T^{-2}$
Gravitational potential	V_g	$V_g = \frac{PE}{m}$	$\frac{J}{kg}$	$M^0L^2T^{-2}$
Temperature	θ	—	Kelvin or K	$M^0L^0T^0\theta^{+1}$
Heat	Q	$Q = m \times S \times \Delta t$	Joule or Calorie	ML^2T^{-2}
Specific heat	S	$Q = m \times S \times \Delta t$	$\frac{Joule}{kg.Kelvin}$	$M^0L^2T^{-2}\theta^{-1}$
Latent heat	L	$Q = mL$	$\frac{Joule}{kg}$	$M^0L^2T^{-2}$
Coefficient of thermal conductivity	K	$Q = \frac{KA(\theta_1-\theta_2)t}{d}$	$\frac{Joule}{m\,sec\,K}$	$MLT^{-3}\theta^{-1}$

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