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## 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 <sup>0</sup> LT <sup>0</sup>
Area	A	t × b	(Metre) <sup>2</sup> or m <sup>2</sup>	M0L2T0
Volume	V	l×b×h	(Metre) <sup>3</sup> or m <sup>3</sup>	M <sub>0</sub> L <sub>3</sub> T <sub>0</sub>
Velocity	v	$v = \frac{\Delta s}{\Delta t}$	m/s	M <sup>0</sup> LT <sup>-1</sup>
Momentum	р	p = mv	kgm/s	MLT-1
Acceleration	a	$a = \frac{\Delta v}{\Delta t}$	m/s <sup>2</sup>	M <sup>0</sup> LT <sup>-2</sup>
Force	F	F = ma	Newton or N	MLT-2
Impulse	-/	F×t	N.sec	MLT-1
Work	w	F. d	N.m	ML <sup>2</sup> T <sup>-2</sup>
Energy	KE or U	$K.E. = \frac{1}{2} mv^2$	Joule or J	ML <sup>2</sup> T-2
	Wild Company	P.E. = mgh		
Power	P	$P = \frac{W}{t}$	watt or W	ML <sup>2</sup> T-3
Density	d	d = mass/volume	kg/m <sup>3</sup>	ML-3T0

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Pressure	B.	P = F/A	Pascal or Pa	ML-1T-2
Torque	τ	$\tau = r \times F$	N.m.	ML <sup>2</sup> T- <sup>2</sup>
Angular displacement	θ	$\theta = \frac{\text{arc}}{\text{radius}}$	radian or rad	M <sub>0</sub> L <sub>0</sub> T <sub>0</sub>
Angular velocity	ω	$\omega = \frac{\theta}{t}$	rad/sec	M <sup>0</sup> L <sup>0</sup> T <sup>-1</sup>
Angular acceleration	α	$\alpha = \frac{\Delta \omega}{\Delta t}$	rad/sec <sup>2</sup>	M <sup>0</sup> L <sup>0</sup> T <sup>-2</sup>
Moment of Inertia	1	I = mr <sup>2</sup>	kg-m²	ML <sup>2</sup> T <sup>0</sup>
Angular momentum	J or L	J = mvr	kgm <sup>2</sup>	ML <sup>2</sup> T-1
Frequency	v or f	$f = \frac{1}{T}$	hertz or Hz	M <sup>0</sup> L <sup>0</sup> T <sup>-1</sup>
Stress	-	F/A	N/m <sup>2</sup>	ML-1T-2
Strain	-	$\frac{\Delta \ell}{\ell}; \frac{\Delta A}{A}; \frac{\Delta V}{V}$		Moroto
Youngs modulus	Y	$Y = \frac{F/A}{\Delta \ell / \ell}$	N/m²	ML-1T-2
(Bulk modulus)				
Surface tension	T	$\frac{F}{\ell}$ or $\frac{W}{A}$	$\frac{N}{m}$ ; $\frac{J}{m^2}$	ML <sup>0</sup> T-2
Force constant (spring)	k	F = kx	N/m	ML <sup>0</sup> T <sup>-2</sup>
Coefficient of viscosity	η	$F = \eta \left(\frac{dv}{dx}\right)A$	kg/ms(poise in C.G.S)	ML-1T-1
Gravitational constant	G	$F = \frac{Gm_1m_2}{r^2}$	$\frac{N-m^2}{kg^2}$	M-1L3T-2
1/4 1/4	314	$\Rightarrow G = \frac{Fr^2}{m_1 m_2}$		
Gravitational potential	Vg	$V_g = \frac{PE}{m}$	J kg	M <sup>0</sup> L <sup>2</sup> T <sup>-2</sup>
Temperature	0	akshahe	Kelvin or K	M0L0T00+1
Heat	Q	$Q = m \times S \times \Delta t$	Joule or Calorie	ML2T-2
Specific heat	s	$Q = m \times S \times \Delta t$	Joule kg.Kelvin	$M^0L^2T^{-2}\theta^-$
Latent heat	ŭ	Q = mL	Joule kg	$M^0L^2T^{-2}$
Coefficient of thermal	к	$Q = \frac{KA(\theta_1 - \theta_2)t}{dt}$	Joule m sec K	MLT-30-1

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Pressure	Р	P = F/A	Pascal or Pa	ML-1T-2
Torque	τ	τ=r×F	N.m.	ML <sup>2</sup> T-2
Angular displacement	θ	$\theta = \frac{\text{arc}}{\text{radius}}$	radian or rad	M <sub>0</sub> L <sub>0</sub> T <sub>0</sub>
Angular velocity	ω	$\omega = \frac{\theta}{t}$	rad/sec	M <sup>0</sup> L <sup>0</sup> T <sup>-1</sup>
Angular acceleration	α	$\alpha = \frac{\Delta \omega}{\Delta t}$	rad/sec <sup>2</sup>	M <sup>0</sup> L <sup>0</sup> T <sup>-2</sup>
Moment of Inertia	1	1 = mr <sup>2</sup>	kg-m²	ML <sup>2</sup> T <sup>0</sup>
Angular momentum	J or L	J = myr	kgm² s	ML <sup>2</sup> T-1
Frequency	v or f	$f = \frac{1}{T}$	hertz or Hz	M <sup>0</sup> L <sup>0</sup> T <sup>-1</sup>
Stress	_	F/A	N/m²	ML-1T-2
Strain	-	$\frac{\Delta \ell}{\ell}; \frac{\Delta A}{A}; \frac{\Delta V}{V}$	_	MoLoTo
Youngs modulus	Y	$Y = \frac{F/A}{\Delta \ell / \ell}$	N/m²	ML-1T-2
(Bulk modulus)	1///			
Surface tension	Т	$\frac{F}{\ell}$ or $\frac{W}{A}$	$\frac{N}{m} \cdot \frac{J}{m^2}$	ML <sup>0</sup> T <sup>-2</sup>
Force constant (spring)	k	F = kx	N/m	ML <sup>0</sup> T <sup>-2</sup>
Coefficient of viscosity	η	$F = \eta \left(\frac{dv}{dx}\right)A$	kg/ms(poise in C.G.S)	ML-1T-1
Gravitational constant	G	$F = \frac{Gm_1m_2}{r^2}$	$\frac{N-m^2}{kg^2}$	M-1L3T-2
17. 1	200	$\Rightarrow G = \frac{Fr^2}{m_1 m_2}$		
Gravitational potential	Vg	$V_g = \frac{PE}{m}$	J kg	M <sup>0</sup> L <sup>2</sup> T <sup>-2</sup>
Temperature	0	akehahe	Kelvin or K	M0L0T00+1
Heat	Q	$Q = m \times S \times \Delta t$	Joule or Calorie	ML <sup>2</sup> T-2
Specific heat	s	$Q = m \times S \times \Delta t$	Joule kg.Kelvin	$M^0L^2T^{-2}\theta^{-1}$
Latent heat	L	Q = mL	Joule kg	$M^0L^2T^{-2}$
Coefficient of thermal conductivity	к	$Q = \frac{KA(\theta_1 - \theta_2)t}{d}$	Joule m secK	MLT <sup>-3</sup> 6 <sup>-1</sup>

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