

Learn the key concepts of Science topic - Dimensions

Hello learner, hope you are doing great. Today we will be studying about the Dimensions of Physical quantity.

Let's firstly know what is dimensions of a physical quantity. Dimensions of a physical quantity are the powers or exponents to which the fundamental quantities must be raised to represent that quantity completely. Suppose there is a new quantity (a quantity for which the dimensional formula is unknown). Now if we want to derive a dimensional formula for this particular quantity, we would have used the fundamental quantities that we already know and we have to raise the fundamental quantities to a certain power (or exponents) in order to derive dimensions of this new quantity. For example, Density = mass/volume, Dimensions of density = $[ML^{-3}] = [M^1L^{-3}T^0]$

All the derived physical quantities of the world can be expressed in terms of some combinations of the seven fundamental or base quantities. We call these fundamental quantities as the seven dimensions of the world, they are

1. Dimension of length = [L]
2. Dimension of mass = [M]
3. Dimension of time = [T]
4. Dimension of electric current = [A]
5. Dimension of thermodynamic temperature = [K]
6. Dimension of luminous intensity = [cd]
7. Dimension of amount of substance = [mol]

Dimensional Formula:

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Sr. No.	Physical Quantity	Relation with other quantities	Dimensional formula	SI Unit
1	area	Length × breadth	$[M^0L^2T^0]$	m^2
2	volume	Length × breadth × height	$[M^0L^3T^0]$	m^3
3	density	Mass / volume	$[ML^{-3}T^0]$	$Kg\ m^{-3}$
4	Speed or velocity	Distance / time	$[M^0LT^{-1}]$	$m\ s^{-1}$
5	acceleration	Change in velocity / time	$[M^0LT^{-2}]$	$m\ s^{-2}$
6	momentum	Mass × velocity	$[MLT^{-1}]$	Kg
7	force	Mass × acceleration	$[MLT^{-2}]$	N
8	work	Force × distance	$[ML^2T^{-2}]$	J
9	energy	Amount of work	$[ML^2T^{-2}]$	J
10	power	Work / time	$[ML^2T^{-3}]$	W
11	pressure	Force / area	$[ML^{-1}T^{-2}]$	Pa
12	Gravitational constant 'G'	$[\text{Force} \times (\text{distance})^2] \div [\text{mass} \times \text{mass}]$	$[M^{-1}L^3T^{-2}]$	Nm^2kg^{-2}