

Dimensions of a Physical Quantity.

When a derived quantity is expressed in terms of fundamental quantities, it is written as a product of different powers of the fundamental quantities. The powers to which fundamental quantities must be raised in order to express the given physical quantity are called its dimensions.

To make it more clear, consider the physical quantity force

$$\text{Force} = \text{mass} \times \text{acceleration} = \frac{\text{mass} \times \text{velocity}}{\text{time}} = \frac{\text{mass} \times \text{length/time}}{\text{time}} = \text{mass} \times \text{length} \times (\text{time})^{-2} \dots (i)$$

Thus, the dimensions of force are 1 in mass, 1 in length and – 2 in time. Here the physical quantity that is expressed in terms of the base quantities is enclosed in square brackets to indicate that the equation is among the dimensions and not among the magnitudes.

Thus equation (i) can be written as $[\text{force}] = [\text{MLT}^{-2}]$.

Such an expression for a physical quantity in terms of the fundamental quantities is called the dimensional equation. If we consider only the R.H.S. of the equation, the expression is termed as dimensional formula.

Thus, dimensional formula for force is, $[\text{MLT}^{-2}]$.