

Learn the key concepts of Science topic - Units

Hi guys, today we are going to study about physical quantities. Physical quantity is any physical property of a material or system that can be quantified. A physical quantity has been assigned a unit to measure that particular quantity and the unit has a fixed reference value. Let's know more about this.

## Physical quantity:

To measure a physical quantity like length, mass and time we require a standard of measurement. This standard of measurement is called the unit of that physical quantity. For example, the unit of length is meters and a standard length of 1 metre has a precise definition. To measure the length of an object is to determine how many times this standard-length meter is contained in the length of a room. The comparison of a physical quantity with a standard quantity is called measurement.

All those quantities that can be measured directly or indirectly and in terms of which the laws of physics can be expressed are called physical quantities. Physical quantities can be fundamental or derived.

**Fundamental Physical Quantities:** Which can be treated as independent of other physical quantities and are not usually defined in terms of other physical quantities are called fundamental quantities. There are seven fundamental or base quantities, they are:

- Mass
- Length
- Time
- Electric current
- Temperature
- Luminous intensity
- Amount of substance

**Derived Physical Quantities:** The physical quantities whose defining operations are based on other physical quantities are called derived quantities. What it means is that the derived quantities are actually a derivation using the fundamental physical quantities and hence are not independent.

## Measurement:

Measurement of a physical quantity is the process of comparing this quantity with a standard amount of the physical quantity of the same kind, called its unit. To express the measurements of a physical quantity, we need to know two things:

- The unit in which the quantity is measured.
- The numerical value or the magnitude of the quantity (the number of times that unit is contained in the given physical quantity.)

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### Physical Unit:

The standard amount of a physical quantity chosen to measure the physical quantity of the same kind is called a physical quantity. There are certain properties of a unit:

1. The unit should be of some suitable size.
2. The unit must be well-defined.
3. The unit should be easily reproducible at all places.
4. The unit must not change with time.
5. The unit should not change with physical conditions like temperature, pressure etc.
6. The unit must be easily comparable experimentally with similar physical quantities.

### Fundamental Unit:

The physical units which can neither be derived from one another, nor they can be further resolved into more simpler units are called fundamental quantities. The units of fundamental quantities are fundamental units.

### Derived Unit:

All other physical units which can be expressed in terms of fundamental units are called derived units. Like: Speed = distance/ time

Unit of speed = unit of distance traveled/unit of time

= meter/second

=  $\text{ms}^{-1}$

## System of units:

A complete set of units which is used to measure all kinds of fundamental and derived quantities is called a system of units.

- (1) **FPS System:** In this system, the unit of length is Foot, unit of mass is Pound and the unit of time is Second.
- (2) **CGS System:** In this system, the units of length, mass and time are Centimeter, Gram and Second, respectively.
- (3) **MKS System:** In this system, the unit of length, mass and time are Meters, Kilogram and Second, respectively.
- (4) **SI System:** This system is widely used in all measurements throughout the world. The system is based on seven basic units and two supplementary units.

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S.no.	Basic physical quantity	Basic unit	Symbol
1.	length	metre	m
2	mass	kilogram	kg
3.	time	second	s
4.	temperature	kelvin	K
5.	Electric current	ampere	A
6.	Luminous intensity	candela	cd
7.	Quantity of matter	mole	mol

## Abbreviations for the power of ten:

When the magnitude of the physical quantities is very large or very small, it is convenient to express them in the multiples or submultiples of the SI units.

**Prefixes for powers of ten:**

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Multiple	Prefix	Sym bol	Sub- multiple	Prefix	Symbol
$10^1$	deca	da	$10^{-1}$	Deci	d
$10^2$	hecto	h	$10^{-2}$	Centi	c
$10^3$	kilo	k	$10^{-3}$	milli	m
$10^6$	mega	M	$10^{-6}$	micro	$\mu$
$10^9$	giga	G	$10^{-9}$	nano	n
$10^{12}$	tera	T	$10^{-12}$	pico	p
$10^{15}$	peta	P	$10^{-15}$	femto	f
$10^{18}$	Exa	E	$10^{-18}$	Atto	a

I hope this blog helped you to clear your queries related to this topic. Stay tuned for more blogs.