

Physics is one of vital subjects among all the subjects of basic sciences.

Definition of Physics : It is that branch of basic science which deals with the study of physical phenomena and the laws governing them.

Every physical phenomenon can be described both qualitatively and quantitatively. e.g. "The body is moving is qualitative description and "The body is moving in a speed in 10 mtr/second" is its quantitative description

The observation of every physical phenomenon is associated a measurable quantity, which is known as physical quantity; e.g. Mass, Length, Time, Speed, Velocity etc

A physical quantity can be measured in terms units. The unit is a standard of reference for each type of physical quantity. Different units are used for different types of physical quantities. e.g. metre(m) for measuring length, Kilogram(Kg) for mass and second(sec) for time

Two types of Physical Quantities.

- FUNDAMENTAL PHYSICAL QUANTITY
- DERIVED PHYSICAL QUANTITY

FUNDAMENTAL PHYSICAL QUANTITY: It is that type of physical quantity which can be expressed by itself only.

e.g. mass, length and time . Mass can be expressed by mass only, Length can be expressed by length only and Time can be expressed by time only. The units used for measuring fundamental physical quantities are known as fundamental units.

DERIVED PHYSICAL QUANTITY: It is that type of physical quantity which can be expressed in terms of other fundamental physical quantities. e.g. Speed Length/Time , Momentum $\text{Mass} \times \text{Length/Time}$, Acceleration Length/Time^2 . The units used for measuring derived physical quantities are known as derived units. e.g. metre/ second for speed. Kg metre/second for measuring momentum etc

SYSTEM OF UNITS: It is a set of fundamental units used in different parts of the world. There are three types of system of units.

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TABLE FOR SYSTEM OF UNITS

SL No	System of units	Physical Quantities	Fundamental Units
1	CGS	Mass, Length & Time	Gram, Centimetre and Second
2	FPS	Mass, Length & Time	Pound(lb), Foot (ft) and Second(s)
3	MKS	Mass, Length & Time	Kilogram(Kg), Metre(m) and Second(s)
4	SI	Mass, length, Time, Electric current, thermodynamic temperature, amount of substance and luminous intensity <small>for ele, Kelvin etc</small>	Kilogram(Kg), Metre(m) and Second(s), Ampere(A), Kelvin(K), Mole(mol), Candela(cd) respectively

Classification of Units:

Fundamental Units

Derived Units

Supplementary units

Fundamental Units: These are the units which can be expressed by itself only. e.g Kg for mass, Metre for length, Second for time, Ampere

Derived units: These are units which can be expressed in terms of other fundamental physical units. e.g metre/second unit for velocity or speed, newton.metre for torque, kilogram metre/second for momentum

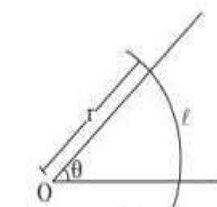
Supplementary Unit: There are two supplementary units in the international system of units given as below.

✓ Radian(Rd) for plane angle

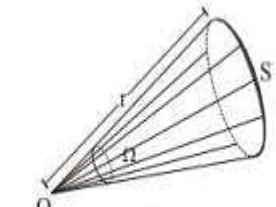
Radian(rad): One radian is defined as the plane angle subtended from the center of a circle which intercepts an arc whose length is equal to the radius of the circle.

Steradian(sr) for solid angle

Steradian(sr): One steradian is defined as the solid angle subtended at the center of a sphere by a surface whose area is equal to the square of the radius of the sphere



plane angle (a)



Solid angle (b)

Basic definitions of units in SI system of units

FUNDAMENTAL PHYSICAL QUANTITY	NAME OF THE UNIT	UNIT SYMBOL	DEFINITIONS
Length	Metre	m	The metre is the length of the path travelled by light in vacuum during the time interval $1/299,792,458$ of a second (1983)
Mass	Kilogram	Kg	The kilogram is equal to the mass of the international prototype of the kilogram(a platinum-iridium alloy cylinder) kept at International Bureau of Weights and Measures near Sevres,Paris,France(1889)
Time	Second	S	The second is the duration of 9,192,631,770 periods of a radiation corresponding to the transition between the two hyper fine levels of the ground state of cesium-133 atom(1967)
Electric Current	Ampere	A	The ampere is that constant current, which if maintained in two straight parallel conductors of infinite length of negligible cross sectional area and placed 1 metre apart in vacuum would experience a force equal to 2×10^{-7} newton/metre of length(1948)
Thermodynamic Temperature	Kelvin	K	The kelvin is the fraction $1/273.16$ of the thermodynamic temperature of triple point of water.(1967)
Amount of substance	Mole	Mol	The mole is a amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilograms of carbon-12(1971)
Luminous Intensity	Candela	cd	The candela is a luminous Intensity of a source of monochromatic radiation of frequency 540×10^{12} hertz in a given direction with $1/683$ watt/steradian(1979)

Apart from base units in SI system, two additional units radian and steradian for plane angle and solid angle described earlier