Competitive Exams: Physics: Basics

Some Useful Definitions

A quantity in the general sense is a property ascribed to phenomena, bodies, or substances that can be quantified for, or assigned to, a particular phenomenon, body, or substance. Examples are mass and electric charge.

A quantity in the particular sense is a quantifiable or assignable property ascribed to a particular phenomenon, body, or substance. Examples are the mass of the moon and the electric charge of the proton.

A physical quantity is a quantity that can be used in the mathematical equations of science and technology.

A unit is a particular physical quantity, defined and adopted by convention, with which other particular quantities of the same kind are compared to express their value.

The value of a physical quantity is the quantitative expression of a particular physical quantity as the product of a number and a unit, the number being its numerical value.

Thus, the numerical value of a particular physical quantity depends on the unit in which it is expressed.

For example, the value of the height hW of the Washington Monument is hW = 169 m = 555 ft. Here hW is the physical quantity, its value expressed in the unit “meter,” unit symbol m, is 169 m, and its numerical value when expressed in meters is 169. However, the value of hW expressed in the unit “foot,” symbol ft, is 555 ft, and its numerical value when expressed in feet is 555.

SI Base Units

The SI is founded on seven SI base units for seven base quantities assumed to be mutually independent

SI base unit

Base quantity	Name	Symbol
Length	meter	m
Mass	kilogram	kg

Time	second	s
Electric current	ampere	A
Thermodynamic Temperature	kelvin	K
Amount of Substance	mole	mol
Luminous Intensity	candela	cd

The following definitions of the SI base units are taken from NIST Special Publication 330 (SP 330), The International System of Units (SI).

Definitions of the SI Base Units

Unit of length	meter	The meter is the length of the path travelled by light in vacuum during a time interval of 1/299 792 458 of a second.
Unit of mass	kilogram	The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram.
Unit of time	second	The second is the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom.
Unit of electric current	ampere	The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to 2 × 10 − 7 newton per meter of length.
Unit of thermodynamic temperature	kelvin	The kelvin, unit of thermodynamic temperature, is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water.
Unit of amount of substance	mole	The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12; its symbol is “mol.” or When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.

Unit of luminous intensity	candela	The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 × 1012 hertz and that has a radiant intensity in that direction of 1/683 watt per steradian.