

3. SI is a metric system. The multiples & sub-multiples of SI units can be expressed in the power of 10.

4. SI is an absolute system of units. Use of 'g' is not required.

5. Internationally accepted.

• Rules for SI-

1. For units small letters.
2. Not followed by a full stop.
3. Symbols are not plural.
4. Full name of a unit is always small.

Common Prefixes in SI system

| S No. | Multiple   | Prefix | Symbol | S no. | Multiple  | Prefix | Symbol |
|-------|------------|--------|--------|-------|-----------|--------|--------|
| 1     | $10^{-1}$  | deci   | d      | 11    | $10^1$    | deca   | da     |
| 2     | $10^{-2}$  | centi  | c      | 12    | $10^2$    | hecto  | h      |
| 3     | $10^{-3}$  | milli  | m      | 13    | $10^3$    | kilo   | k      |
| 4     | $10^{-6}$  | micro  | $\mu$  | 14    | $10^6$    | mega   | M      |
| 5     | $10^{-9}$  | nano   | n      | 15    | $10^9$    | giga   | G      |
| 6     | $10^{-12}$ | pico   | p      | 16    | $10^{12}$ | tera   | T      |
| 7     | $10^{-15}$ | femto  | f      | 17    | $10^{15}$ | peta   | P      |
| 8     | $10^{-18}$ | atto   | a      | 18    | $10^{18}$ | exa    | E      |
| 9     | $10^{-21}$ | zepto  | z      | 19    | $10^{21}$ | zetta  | Z      |
| 10    | $10^{-24}$ | yocto  | y      | 20    | $10^{24}$ | yocto  | Y      |

• Some other measuring units-

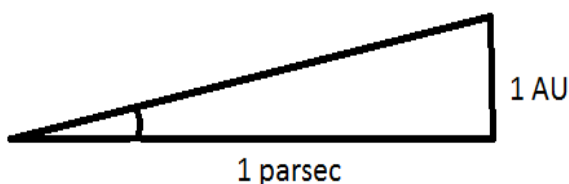
1. Angstrom- It is used to express wavelength of light.

2. Light Year- It is the distance travelled by light in a year.

$$1 \text{ light year} = \text{speed of light} \times 1 \text{ year}$$

3. Astronomical unit- Mean distance of earth from sun.

4. Parsec (parallactic second)- It is defined as the distance at which an arc of length 1 AU subtends an angle of 1 second of arc.



✓  $1 \text{ \AA} = 10^{-10} \text{ m}$

✓  $1 \text{ light year} = 9.467 \times 10^{15} \text{ m}$

✓  $1 \text{ astronomical unit} = 1 \text{ AU} = 1.496 \times 10^{11} \text{ m}$

✓  $1 \text{ Parsec} = 1.496 \times 10^{11} \times 3600 \times 180 \times 1/\pi = 3.08 \times 10^{16} \text{ m}$

✓  $1 \text{ barn} = 10^{-28} \text{ m}^2$

✓  $1 \text{ Acre} = 4047 \text{ m}^2$

✓  $1 \text{ hectare} = 10^4 \text{ m}^2$

✓  $1 \text{ tonne} = 1000 \text{ kg}$

|    |                                            |           |
|----|--------------------------------------------|-----------|
| 7  | Period of sound wave                       | $10^{-3}$ |
| 8  | Wink of eye                                | $10^{-1}$ |
| 9  | Time period between successive heart beats | $10^0$    |
| 10 | Travel time for light from moon to earth   | $10^0$    |
| 11 | Travel time for light from sun to earth    | $10^2$    |
| 12 | Time period of a satellite                 | $10^4$    |
| 13 | Period of rotation of the earth            | $10^5$    |
| 14 | Period of revolution of the earth          | $10^7$    |
| 15 | Time travel of light from nearest star     | $10^8$    |
| 16 | Average human life span                    | $10^9$    |
| 17 | Age of universe                            | $10^{17}$ |

### Dimensions of a Physical quantity

All the derived quantities can be expressed in the terms of some combination of 7 fundamental or base quantities. These seven fundamental quantities are known as the seven dimensions of the world, which are denoted with square bracket.

| Dimension   | Denotation | Dimension           | Denotation |
|-------------|------------|---------------------|------------|
| Mass        | [M]        | Electric Current    | [A]        |
| length      | [L]        | Luminous intensity  | [cd]       |
| Time        | [T]        | Amount of substance | [mol]      |
| Temperature | [K]        |                     |            |

**Dimensional Equation** - The equation obtained by equating a physical quantity with its dimensional formula is called the dimensional equation of given physical quantity.

| S No.                        | Physical quantity         | Relation with other quantities                      | Dimensional formula | SI unit       |
|------------------------------|---------------------------|-----------------------------------------------------|---------------------|---------------|
| <b>Mechanical Quantities</b> |                           |                                                     |                     |               |
| 1                            | Area                      | Length x breadth                                    | $[M^0L^2T^0]$       | $m^2$         |
| 2                            | Volume                    | Length x breadth x height                           | $[M^0L^3T^0]$       | $m^3$         |
| 3                            | Density                   | Mass / volume                                       | $[M^1L^{-3}T^0]$    | $kg\ m^{-3}$  |
| 4                            | speed                     | Distance / time                                     | $[M^0L^1T^{-1}]$    | $m\ s^{-1}$   |
| 5                            | Acceleration              | Velocity / time                                     | $[M^0L^1T^{-2}]$    | $m\ s^{-2}$   |
| 6                            | Momentum                  | Mass x velocity                                     | $[M^1L^1T^{-1}]$    | $kg\ ms^{-1}$ |
| 7                            | Force                     | Mass x acceleration                                 | $[M^1L^1T^{-2}]$    | N             |
| 8                            | Work                      | Force x displacement                                | $[M^1L^2T^{-2}]$    | J             |
| 9                            | Energy                    | Amount of work                                      | $[M^1L^2T^{-2}]$    | J             |
| 10                           | Power                     | Energy / Time                                       | $[M^1L^2T^{-3}]$    | W             |
| 11                           | Pressure                  | Force / Area                                        | $[M^1L^{-1}T^{-2}]$ | Pa            |
| 12                           | Torque (moment of force)  | Force x perpendicular distance                      | $[M^1L^2T^{-2}]$    | Nm            |
| 13                           | 'G'                       | Force x (distance) <sup>2</sup> / mass <sup>2</sup> | $[M^{-1}L^3T^{-2}]$ | $Nm^2kg^{-2}$ |
| 14                           | Impulse of a Force        | Force x time                                        | $[M^1L^1T^{-1}]$    | N s           |
| 15                           | Stress                    | Force / Area                                        | $[M^1L^{-1}T^{-2}]$ | $N\ m^{-2}$   |
| 16                           | Strain                    | Change in dimension / Original dimension            | $[M^0L^0T^0]$       | —             |
| 17                           | Coefficient of Elasticity | Stress / Strain                                     | $[M^0L^{-1}T^{-2}]$ | $N\ m^{-2}$   |
| 18                           | Surface Tension           | Force / Length                                      | $[M^1L^0T^{-2}]$    | $N\ m^{-1}$   |
| 19                           | Surface Energy            | Work / Area                                         | $[M^1L^0T^{-2}]$    | $J\ m^{-2}$   |
| 20                           | Coefficient of            | Force x distance                                    | $[M^1L^{-1}T^{-1}]$ | Pa s          |