**PHYSICAL QUANTITIES AND UNITS**

All physical quantities consist of a numerical magnitude and a unit. The ***base quantities*** are mass (m in kg), length (l in m), time (t in s), current (I in A), temperature (T in K), amount of substance (n in mol), and luminous intensity (*I* in Cd).

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| --- | --- | --- | --- |
| ***Quantity*** | ***Symbol*** | ***Unit*** | ***Unit Symbol*** |
| Mass | m | Kilograms | kg |
| Length | l | Metre | m |
| Time | t | Second | S |
| Temperature | I | Kelvin | K |
| Current | A | Ampere | A |
| Amount of substance | mol | Mole | mol |
| Luminous intensity | *I* | Candela | cd |

**Units and Homogeneity**

A physical quantity is true no matter the system of units used for the physical quantities mentioned in the equation. Each ***term*** in the equation must have the same units. Only quantities with the same units can be added, subtracted or equated in an equation. An equation is said to be homogeneous if ***all*** the ***terms*** have the same units.

Example: s = ut + ½at2 is homogeneous because ***all terms*** have the same units i.e. metres. s ≡ m, ut ≡ ms-1 x s = m, and ½at2 ≡ ms-2 x s2 = m. Note that the constant in this case (i.e. ½) has no units.

If however all the terms do not have the same units then it can be concluded that the equation is ***wrong***. An equation which is not homogeneous ***must*** be wrong. On the other hand, if the units for the various terms in an equation are the same, this ***does not*** imply that the equation is correct. The equation may have ***incorrect coefficients***, example s = 3ut + ½at2, or ***missing terms***, example s = ½at2, or ***extra terms***, example s = vt + ut + ½at2.

**Prefixes**

Prefixes are used for multiples and sub-multiples of base and derived quantities.

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| Multiples | Sub-Multiples |
| Deca (da) = 10 | Pico (p) = 10-12 |
| Hecto (h) = 102 | Nano (n) = 10-9 |
| Kilo (k) = 103 | Micro (µ) = 10-6 |
| Mega (M) = 106 | Milli (m) = 10-3 |
| Giga (G) = 109 | Centi (c) = 10-2 |
|  | Deci (d) = 10-1 |