physics units & dimensions Cheat Sheet

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units

when measuring any physical quantity we compare it to a standard reference point known as a **unit**

i) **fundamental units**, these are fundamental or base quantities which are not derived

ii) **derived units**, these are the units of other physical quantities and can be expressed as a combination of multiple fundamental units

(together they are know as the system of units)

international system of units

CGS system- the system where centimeter (L), gram (M), seconds (T)

FPS system [british system]- the system where foot (L), pound (M), seconds (T)

MKS system- the system where meter (L), kilogram (M), seconds (T)

International system of units

SI units- it's the present system of units which is internationally accepted for measurement.

It has **seven** base units which then can be combined with each other to form the derived units

SI units

quantity	name	symbol
length	meter	m
mass	kilogram	kg
time	second	s
electric	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Dimensions of Physical quantities

the dimensions of a physical quantity are the powers (or the exponents) to which the base quantities are raised to represent that quantity

square brackets [ ] are used to indicate the dimensions

An equation obtained by equating a physical quantity with its dimensional formula is called the dimensional equation of the physical quantity. In other words it can be said that dimensional equations represent the dimensions of a physical quantity in terms of the base quantity

examples

Volume - $[V] = [M^0 L^3 T^0]$

Speed - $[v] = [M^0 L T^{-1}]$

Force - $[F] = [M L T^{-2}]$

Mass density - $[\rho] = [M L^{-3} T^0]$

dimensional analysis

Dimensional analysis is the practice of checking relations between physical quantities by identifying the dimensions of the physical quantities. These dimensions are independent of the numerical multiples and constants

It helps us deduce certain relations between different physical quantities and checking the derivation, accuracy and dimensional consistency of the mathematical expressions

applications of dimensional analysis

We make use of dimensional analysis for three prominent reasons:

1) To check the consistency of a dimensional equation

2) To derive the relation between physical quantities in physical phenomena

3) To change units from one system to another

links for more

unites and dimension basic pointers

dimensional analysis (specific)

notes for the entire chapter

more notes for the chapter

questions

pdf of questions

HOTS questions

limitations of dimensional analysis

Some limitations of dimensional analysis are:

1) It doesn’t give information about the dimensional constant.

2) The formula containing trigonometric function, exponential functions, logarithmic function, etc. cannot be derived.

3) It gives no information about whether a physical quantity is a scalar or vector.