

General Physics (1)

1

CHAPTER 01 – PHYSICS AND MEASUREMENTS

20-Oct-20

Basic Quantities and Their Units

2

Quantity	SI Unit
Length	meter
Mass	kilogram
Time	second
Temperature	Kelvin
Electric Current	Ampere
Luminous Intensity	Candela
Amount of Substance	mole

20-Oct-20

Quantities Used in Mechanics

3

- In mechanics, three basic quantities are used:
 - Length
 - Mass
 - Time
- Derived quantities: all other quantities in mechanics that can be expressed in terms of the three fundamental quantities.
 - Velocity (m/s)
 - Acceleration (m/s^2)
 - Force ($\text{Newton} = kg \cdot m/s^2$)

20-Oct-20

Prefixes

4

- Prefixes correspond to powers of 10.
- Each prefix has a specific name.
- Each prefix has a specific abbreviation.
- The prefixes can be used with any basic units.
- They are multipliers of the basic unit.
- Examples:
 - $L = 1 \text{ mm} = 10^{-3} \text{ m}$
 - $m = 1 \text{ mg} = 10^{-3} \text{ g}$
 - $t = 1 \text{ ks} = 10^3 \text{ s}$

20-Oct-20

Prefixes, cont.

5

Power	Prefix	Abbreviation	Power	Prefix	Abbreviation
10^{-24}	yocto	y	10^1	deka	da
10^{-21}	zepto	z	10^2	hecto	h
10^{-18}	atto	a	10^3	kilo	k
10^{-15}	femto	f	10^6	mega	M
10^{-12}	pico	p	10^9	giga	G
10^{-9}	nano	n	10^{12}	tera	T
10^{-6}	micro	μ	10^{15}	peta	P
10^{-3}	milli	m	10^{18}	exa	E
10^{-2}	centi	c	10^{21}	zetta	Z
10^{-1}	deci	d	10^{24}	yotta	Y

20-Oct-20

Basic and Derived Units

6

- Derived quantities can be expressed as a mathematical combination of fundamental quantities.
- Examples:
 - Area
 - ✦ A product of two lengths
 - Speed
 - ✦ A ratio of a length to a time interval
 - Density
 - ✦ A ratio of mass to volume

20-Oct-20

Basic Quantities and Their Dimension

7

- Dimensions are often denoted with square brackets.
 - Length [L]
 - Mass [M]
 - Time [T]
- Velocity (L/T)
- Acceleration (L/T^2)
- Force (*Newton* = $M \cdot L/T^2$)

20-Oct-20

Conversion of Units

8

- When units are not consistent, you may need to convert to appropriate ones.
- Units can be treated like algebraic quantities that can cancel each other out.
- Always include units for every quantity, you can carry the units through the entire calculation.
 - Will help detect possible errors

20-Oct-20