# Hindbookcenter

GET IT ON Google Play

# Hind Book Center & Photostat

# MADE EASY

## BPSC AE-2025

## GENERAL STUDIES

## HANWRITTEN NOTES

- Colour Print Out
- Blackinwhite Print Out
- Spiral Binding,& Hard Binding
- Test Paper For IES GATE PSUs IAS, CAT
- All Notes Available & All Book Availabie
- Best Quaity Handwritten Classroom Notes & Study Materials
- IES GATE PSUs IAS CAT Other Competitive/Entrence Exams

**Visit us:-www.hindbookcenter.com**

**Courier Facility All Over India**
**(DTDC & INDIA POST)**
**Mob-9654451541**

# Physics

Father of physics → Galileo Galilei / Newton / Einstein

**Quantity** → Any measurable thing which expressed in number is called quantity.

**Quantities**
- ① Scalar quantities (अदिश राशियाँ)
- ② Vector quantities (सदिश राशियाँ)

① **Scalar quantities:** Those quantities which have magnitude only for their expressions are called scalar quantities.

Ex: Speed, Temperature, Time, Volume, Density, work, power, energy, electric current, mass, Distance etc.

② **Vector quantities:** Those quantities which have magnitude & direction both for their expression are called Vector quantities.

Ex: Velocity, Force, Torque, acceleration, weight, Displacement, Momentum etc.

## System of units

① CGS (Centimeter Gram second system)

→ It is also called French or metric system of units.

② FPS (Foot pound second system)

→ It is also called british system of units.

③ MKS (meter kilogram second system)

④ S.I (System International system).

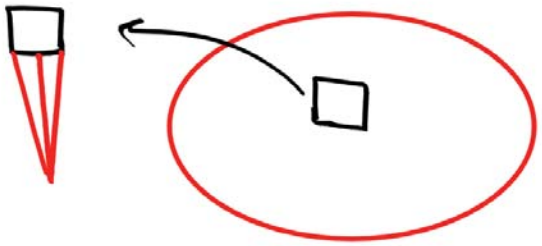
Indeed, it is the improved & extended form of MKS system which adopted in 1960 at Geneva (Switzerland)

There are 7 fundamental & two supplentary units in S.I system.

| S.N | Quantity | S.I unit | Symbol |
|---|---|---|---|
| 1. | Length | meter | m |
| 2. | Mass | kilogram | kg |
| 3. | Time | second | s |
| 4. | Temperature | Kelvin | K or θ |
| 5. | Electric current | Ampere | A |
| 6. | Luminous Intensity | Candela | Cd |
| 7. | Amount of substance | Mole | mol |

## Supplementary units

| S.N | Quantity | S.I unit | Symbol |
|---|---|---|---|
| 1. | Plane Angle | radian | rad |
| 2. | Solid Angle | Steradian | Sr |



## Astronomical units of distance

① **Astronomical (AU):** It is the mean distance b/w earth & sun.

$$1AU = 1.495 \times 10^{11} \text{ meter}$$

② **Light year (LY):** It is also the unit of distance, which distance travelled by light in vacuum in one year.

$$1LY = 9.46 \times 10^{15} \text{ meter}$$

③ Parsec (Parallax second):
(PS)

→ It is the largest unit of distance among all astronomical units of distance.

$1\,PS = 3.08 \times 10^{16}$ meter

Relation $1\,PS = 3.26\,LY$

Force

① Contact forces

Ex: Adhesive force,
Cohesive force
Centripetal force
Centrifugal force
Frictional force,
Muscular force etc.

② Non-Contact Forces

Ex: Gravitational force
Magnetic force.

① **Adhesive Force** : The force which act between different molecules/material is called adhesive force.

Ex: Attachment of Glustick with paper

Ex: Strength of an alloy

Ex: Applying paint on walls.

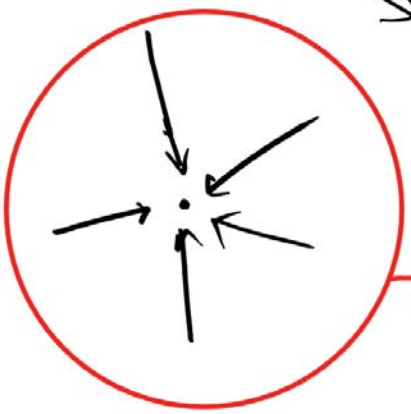
② **Cohesive Force** : The force which act between same type of molecules/material is called cohesive force.

Ex: Strength of a pure metal

Ex: The phenomenon of surface tension.

③ **Centripetal Force**

→ During circulation motion a force act from periphery to the centre of the path is called centripetal force.



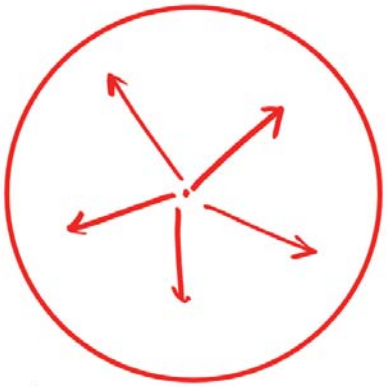

$$F = \frac{mv^2}{r}$$

Ex: Roads & railway tracks are superelevated at a turn to obtained the required centripetal force.

Ex: Driving of car in death well is based on centripetal force.

## ④ Centrifugal force

During circulation motion a force act from centre to the periphery of the path is called centrifugal force.



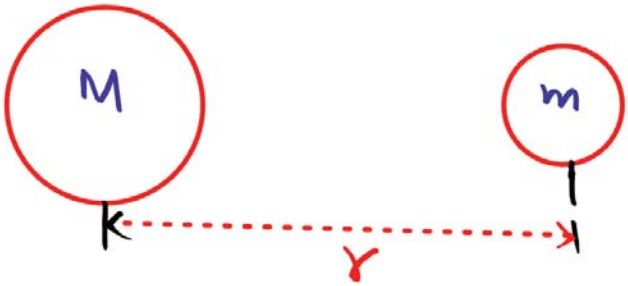
→ It is not a new force, it is a pseudo (False) force which is always equal & opposite to the centripetal force.

Ex: Centrifugal machine, Washing machine, Centrifugal drier, Grinder, Churner, Cream separator etc.

## ⑤ Gravitational Force (गुरुत्वाकर्षण बल)

→ It is an attractive force which act between two bodies.

→ It is based on distance between objects & their mass.




$F \propto M \times m \longrightarrow (1)$

$F \propto \frac{1}{r^2} \longrightarrow (2)$

From eq 1 & 2

$$F \propto \frac{M \times m}{r^2} \longrightarrow (3)$$

$$F = G\frac{M \times m}{r^2} \rightarrow (4)$$

G = Gravitational constant

$6.67 \times 10^{-11}\ Nm^2kg^{-2}$

## Relation between G & g

Second law of newton $F = m.a$

$$F = m.g \rightarrow (5)$$

Putting the value of F from eq 5 to eq 4

$$m.g = G\frac{M \times m}{r^2}$$

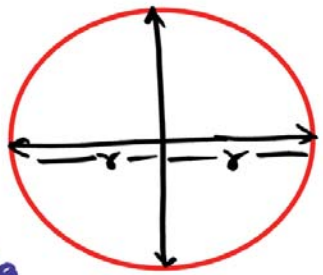
$$g = \frac{GM}{r^2} \rightarrow (6)$$

g = gravity गुरुत्व

Mass of earth = $6 \times 10^{24}$ kg

Radius of earth = $6.4 \times 10^{6}$ m

$G = 6.67 \times 10^{-11}\ N M^2 kg^{-2}$




$$g = \frac{6.67 \times 10^{-11}\ Nm^2kg^{-2} \times 6 \times 10^{24}\ kg}{(6.4 \times 10^{6}\ m)}$$

$g = 9.8\ m/s^2$

## Mass & weight

- unit of weight $kgms^{-2}$ or Newton (N)
- weight is variable because it is based on mass & multiplication of gravity

actual amount (quantity) of material in an object
(always constant in everywhere)

Unit of mass = kg

Ex:

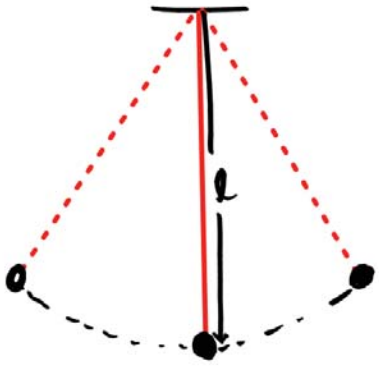
$m = 60\,kg$

$w = 60\,kg \times 10\,ms^{-2}$

$= 600\,kgms^{-2}$ or $600\,N$

- At the poles of earth there is maximum gravity.
- There is zero gravity at the centre of the earth.

## Simple Pendulum




$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T \propto \sqrt{l}$$

$$T \propto \sqrt{\frac{l}{g}}$$

$$g_{moon} = \frac{1}{6} g_{earth}$$

At the poles of the earth a pendulum watch will be faster because there is more gravity as compare to the equator of the earth that by the Timeperiod will decrease.

Ans Person's mass on earth = 60 kg
" " on moon = 60 kg

Weight(e) = 60kg × 10 m/s²
= 600 N

weight(m) = 60kg × 10/6 m/s²
= 100 N

- A freely falling body is based on following factors —
  1. Density
  2. Surface area
  3. Air resistance

- If the same weight an iron ball & a wooden ball are droped from the same height at the same time then iron ball will reach first to the ground because the density of iron is less than density of wood.

Iron density > Wood density

Surface area of Iron < Surface area of wood

- If a feather & a stone are dropped from the same height at the same time in Vacuum than both will reach to the ground at the same time.
- If the two objects of the same density are dropped from from the same height at the same time than both will reach to ground at the same time.

## Density ঘনত্ব

Water has maximum density at 4°C

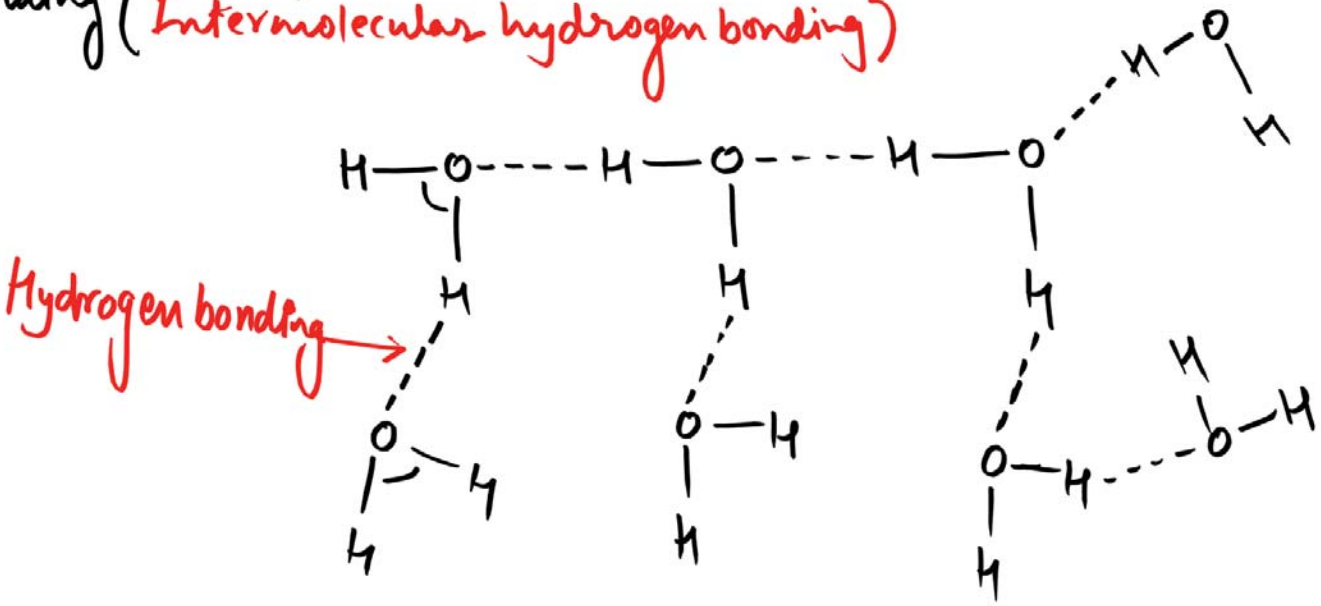
$$\text{density}(\rho) = \frac{\text{mass}}{\text{volume}}$$

$$\text{unit} = kg/m^3 \text{ or } g/cm^3$$

$$\text{Relative density} = \frac{\text{Density of material}}{\text{Density of water at } 4^\circ C}$$

no unit

When water changes into ice then volume increases due to the hydrogen bonding (Intermolecular hydrogen bonding)



**Chemistry**

↓

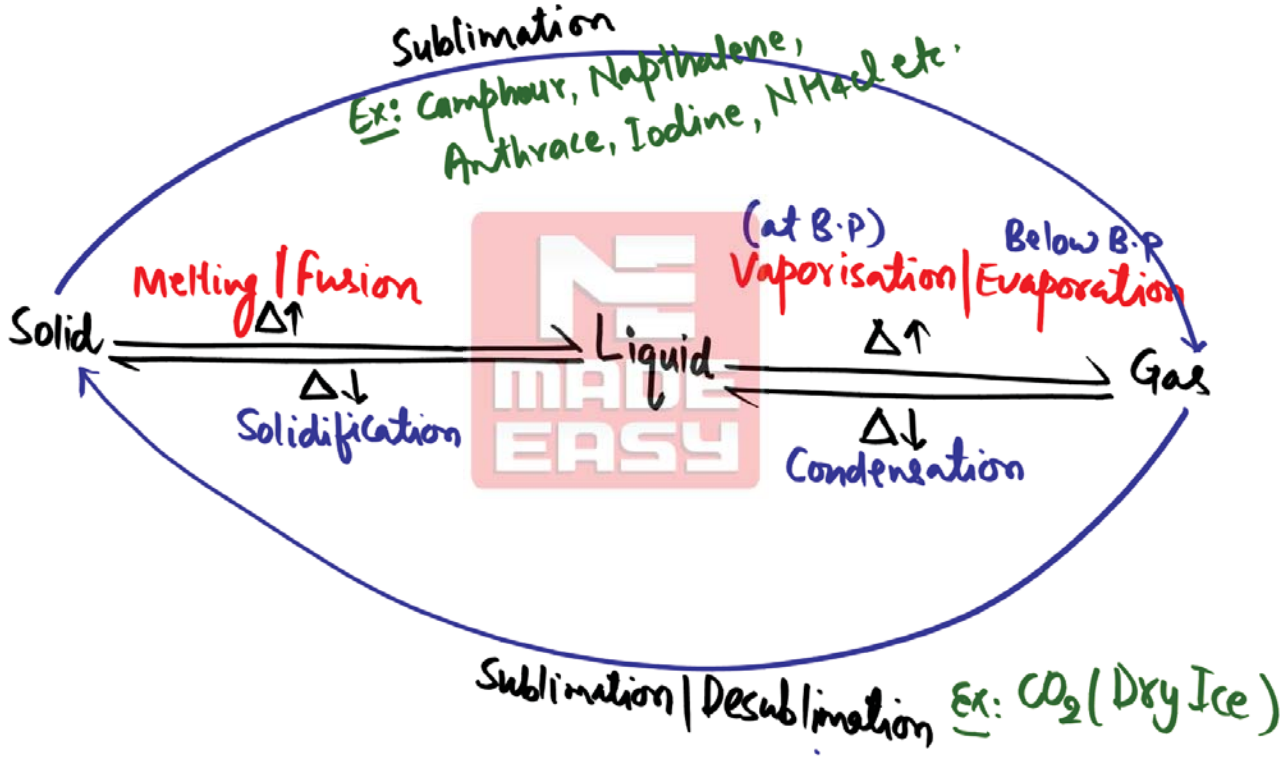
Chemistry word derived from 'Egyption word 'Chemia" which means black.

**Matter:** Anything which has defenite mass & occupy the space is called matter.

**States of matter**

1. Solid
2. Liquid
3. Gas
4. Plasma
5. Bose-Einstein condensate (BEC)

## Interconversion of Matter



Elements तत्व ⇒ Currently 118 elements are known to human

- ① Metals धातुएं
- ② Non-metals अधातुएं
- ③ Metalloids अर्द्धधातुएं

① Metals
- Malleable → Can be drawn into sheets
- Ductility → Can be drawn into wire
- good conductors of heat & electricity
- Lustrous → metallic shining
- Sonorous सुरीली
  - Produces ringing sound when hit.

→ All metals are solid except Mercury (Hg) which is a liquid at room temperature

Mercury (Hg)
- heavy metal
- poisonous metal
- also called quick silver
- Comparatively poor conductor of heat

Note: Lead (Pb) → is also poor conductor of heat.

Gold (Au) → most malleable metal

most ductile metal (1 Gram Gold ⟶ 2 km wire)

Platinum (Pt) → also called white Gold

Lithium (Li) → lowest density among all metals (Lightest metal)

→ use to make batteries & artificial pacemaker.

Cesium (Cs) → highest density (heaviest metal)

Casium, Francium & Gallium (Ga) → get melted when we put on palm.
(Cs) (Fr)

Lithium, Sodium & Potassium (K) ⇒ soft metals which can be cut by Knife.
(Li) (Na)

↓ alkali metals

→ low density & low Melting point (M.P)

→ Titanium metal (Ti) → Metal of future

→ Uranium metal (U) → Metal of hope

→ Potassium (K) & Sodium (Na) → highly reactive metals

⇓ Fire

⇓ always kept in kerosine oil

## Fire Works आतिशबाजी

① Crimson red Colour ⟶ Strontium (Sr) metal

② Green colour ⟶ Barium (Ba)

③ White colour ⟶ Magnesium (Mg)

Note: Barium sulphate ($BaSO_4$) ⟶ Called Barium Meal

⇓

used in the X-Ray of abdomen.

## Metal Toxicity (Excess amount of metals in our body)

- Mercury (Hg) → Causes 'Minamata disease
- Cadmium (Cd) → itai-itai or ouch-ouch disease.
- Copper (Cu) → Wilson's disease or wilson syndrome

⇓

(Liver affected)

Tungston (W) → use to make filament of electric bulb

→ M.P ≃ 3380°C

→ high resistance

↓

Strongest metal

Chromium (Cr) → hardest metal

Reaction of metals with oxygen → metal oxide formed

$2Mg + O_2 \longrightarrow 2MgO$

Magnesium oxide

$2Cu + O_2 \longrightarrow 2CuO$

Copper oxide

Note: Anodising → used to deposite a layer of oxide on the aluminium (Al)

⇓

Prevent from corrosion.

## Reactions of metals with Acid

$Fe + 2HCl \longrightarrow FeCl_2 + H_2\uparrow$

Fe: metal; HCl: dilute HCl

$Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2\uparrow$

Fe: metal; $H_2SO_4$: Acid