ARJUNA NEET BATCH

BY : DOLLY SHARMA

States of Matter

LECTURE - 2

Types of Forces

Inter molecular

- ion - Dipole
- Dipole Dipole
- ion - induced dipole
- induced Dipole - induced Dipole
- H-Bonding
- Repulsive forces

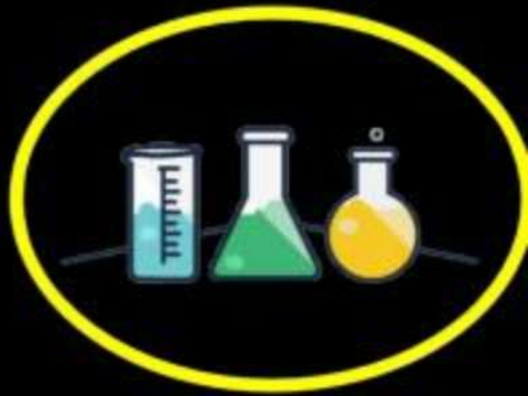
Intra - molecular

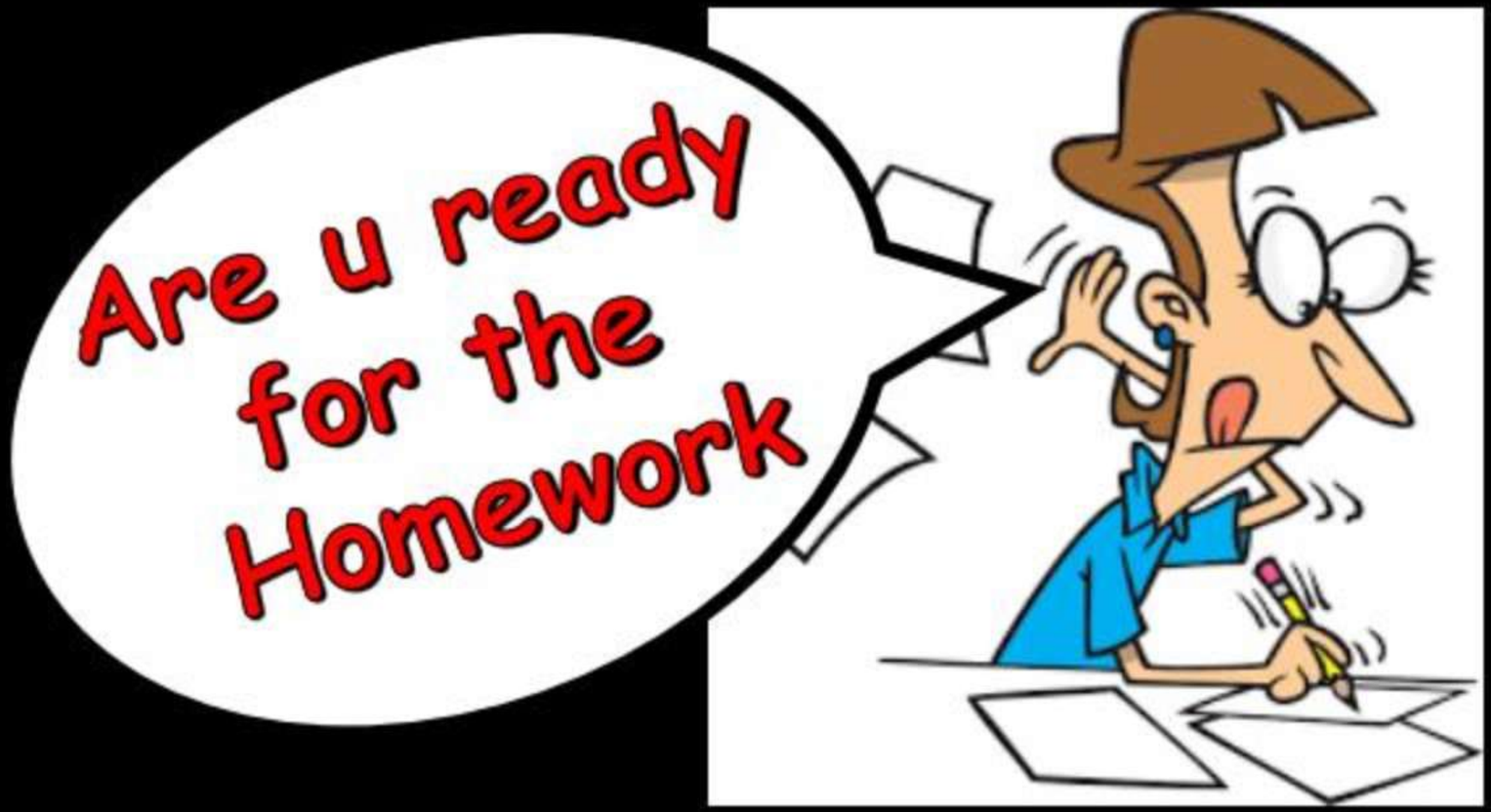
- Ionic
- Covalent

Rotationary dipole $\propto \frac{1}{r^6}$

Objective of today's class

Gas Laws




Are u ready for the Homework

Q. What volume of 0.5 M H_2SO_4 is required to neutralize 10 gm NaOH completely.

(Acid) H_2SO_4 = NaOH (Base)

No. of gram Eq. of H_2SO_4 = No. of gram Eq. of NaOH

$$M \times V(L) \times n\text{-factor} = \frac{\omega}{MM} \times n\text{-f}$$

$$\frac{0.5}{10} \times V(L) \times 2 = \frac{10}{40} \times 1$$

$$V(L) = \frac{10}{4 \times 5 \times 2} \Rightarrow 0.25\ L$$

ARJUNA

Q. Pyrolucite (MnO_2) on reaction with HCl produce Cl_2 gas at STP. How many kg of MnO_2 is required. Given that % yield of rxⁿ is 60%.

2.24L

60% η

$$MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$$

Kg = ?

$$\frac{60}{100} \times \frac{1}{1} \eta_{MnO_2} = \frac{1}{1} \eta_{Cl_2}$$

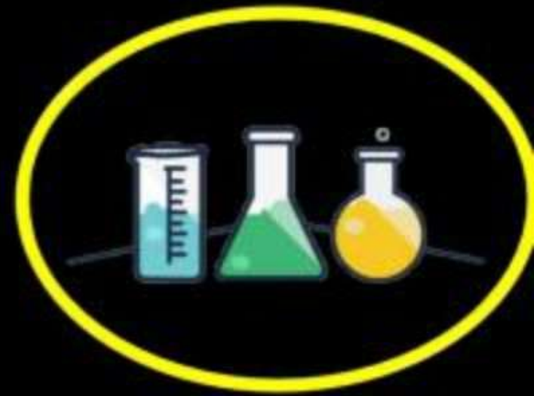
$$\frac{w}{87} \times \frac{60}{100} = \frac{2.24}{22.4}$$

$w \Rightarrow$ ____ Kg

S-1 Write the Balanced chemical Rxⁿ

S-2 given = required

$S_0M_0 = S_0M_0$



Q. A solution of Ammonium nitrate (NH_4NO_3) in water is 20% (W/V). If the density is 1.3 gm/ml, then find mole fraction of NH_4NO_3 in the solution?

20% (w/v) NH_4NO_3

→ 20 g of NH_4NO_3 present in 100 ml of Solution

$d = 1.3$ gm/ml

$d = \frac{w}{V}$

$w_{sol} = d \times V$

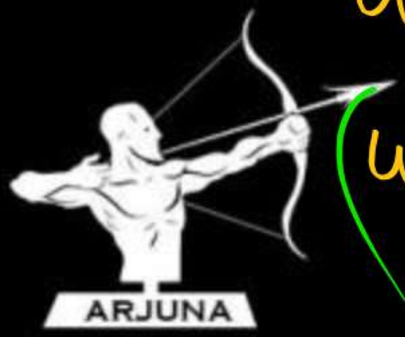
$= 130$ gm

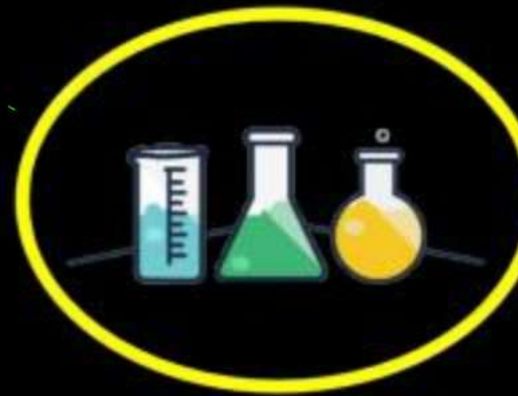
$X_{NH_4NO_3} = \frac{n_{NH_4NO_3}}{n_{NH_4NO_3} + n_{H_2O}}$

$= \frac{\frac{20}{80}}{\frac{20}{80} + \frac{110}{18}} \approx 0.039$

$w_{solvent} = 130 - 20$

$= 110$ g





Q. At constant temp. and pressure air condenser 79% dinitrogen, 20% dioxygen, 1% CO_2 by volume. Find mole fraction of N_2 in air.

$N_2 = 79\%$
$O_2 = 20\%$
$CO_2 = 1\%$
} ≡ by Volume

$n_{N_2} = 79$
$n_{O_2} = 20$
$n_{CO_2} = 1$

$V \propto n$

$$X_{N_2} = \frac{n_{N_2}}{T_0 M_0}$$

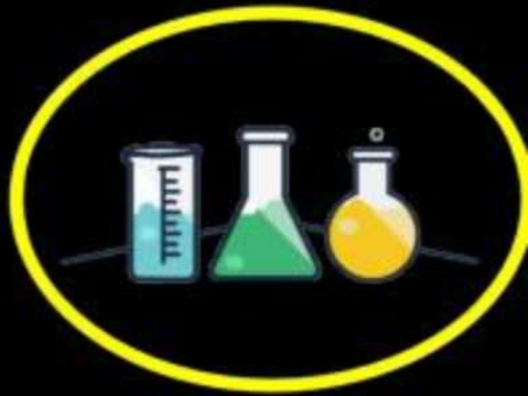
$$\Rightarrow \frac{79}{100} \Rightarrow 0.79$$

Repeat

Dipole Moment / Polarisability

The induced dipole moment depends upon mainly on two factors :

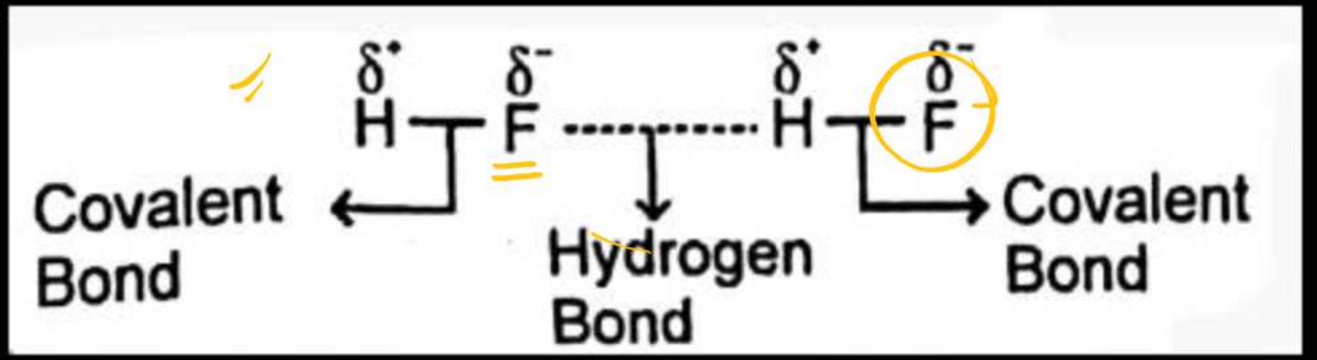
- **Dipole Moment :** Present in the permanent dipole (polar molecule)
- **Polarisability** of the electrically neutral molecule (Non-polar molecule). Molecules of larger size get polarised easily, thereby strength of attractive interactions increases.

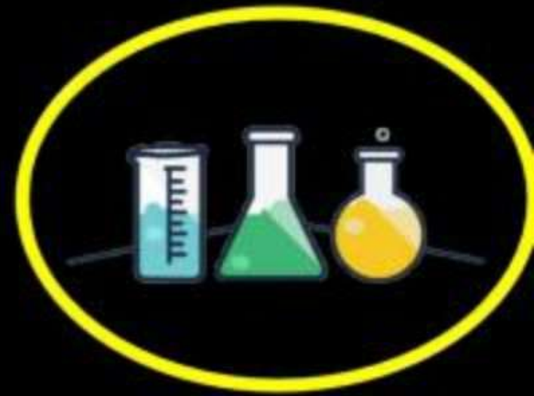


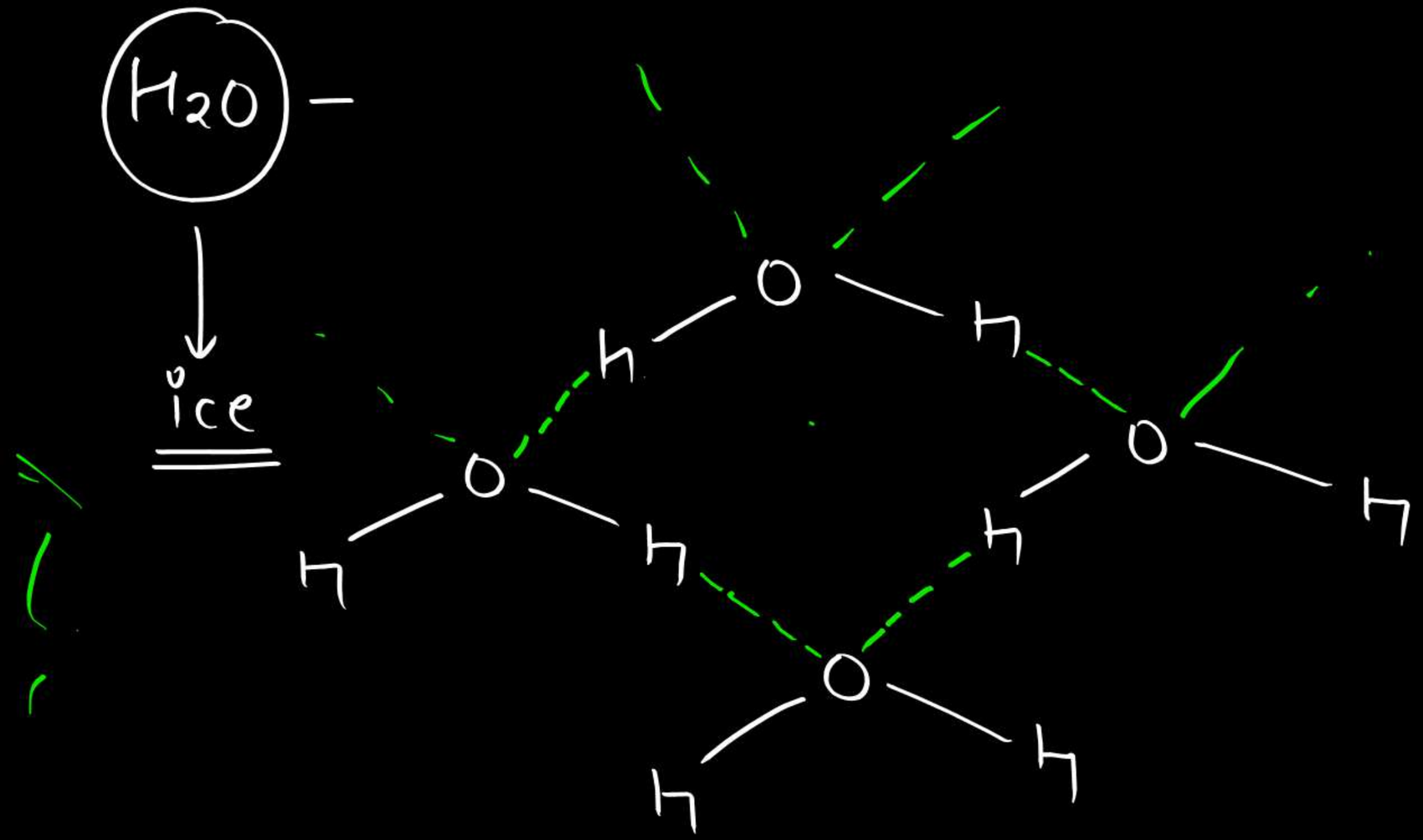
Hydrogen Bonding

Repeat

Hydrogen bonding is a special type of dipole-dipole interaction. But the difference is that for hydrogen bonding there is large difference in the electronegativity of the covalently bonded atoms. That means hydrogen bonds are formed between the highly polar N–H, O–H and H–F bonds. Thus, hydrogen bonding is the force of attraction between the hydrogen atom attached to the highly electronegative atom and the electronegative atom of the other polar molecule. Example H_2O, NH_3, HF etc.



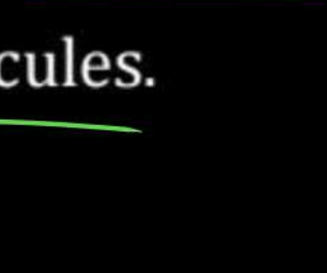


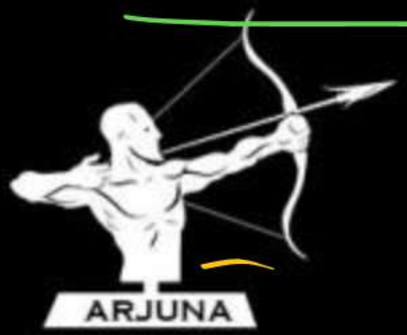

H2O
ice
O
H
O
H
O
H
O
H
H
H
H
H
H
H

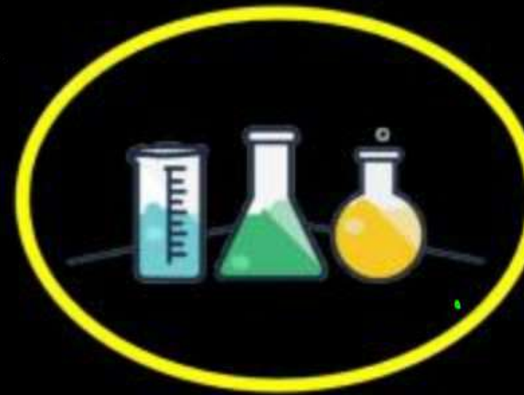
Repulsive Forces

Repeat

Repulsive Forces: The intermolecular forces discussed like London forces, dipole-dipole interactions, dipole Induced dipole interactions and hydrogen bonding are all attractive. But the molecules also exert repulsive forces on one another. When the molecules come very close to each other or just come in contact with each other, then repulsive forces operate between the electron clouds of the two molecules and between the nuclei of two molecules.





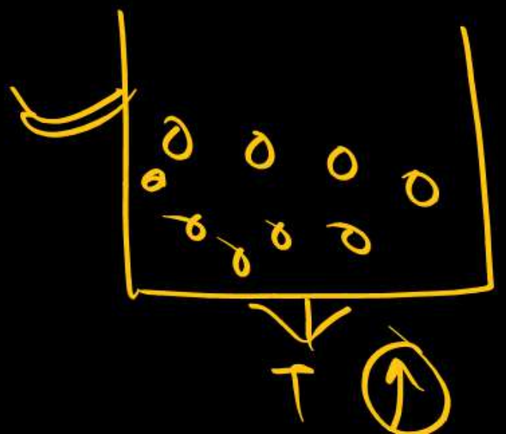


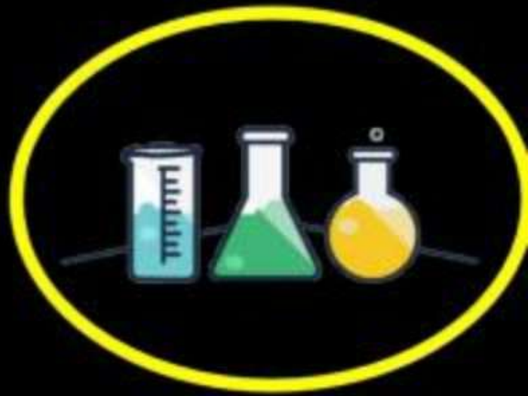
THERMAL ENERGY

16/June/2021

- Thermal energy is the energy of a body due to motion or movement of its atoms or molecules.
- Temperature increases, thermal energy increases.
- Kinetic energy of the atoms and molecules also increases.
- Thus thermal energy is the measure of average kinetic energy of the particles of matter and responsible for the movement of particles.

is.





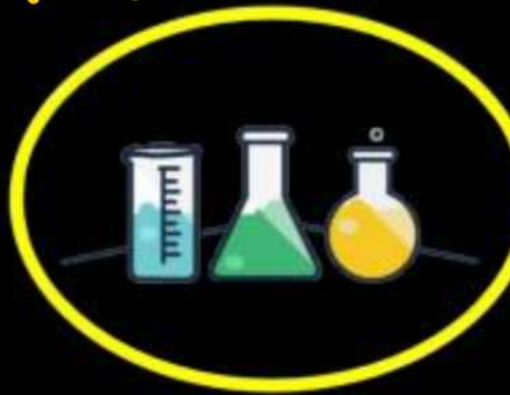
INTERMOLECULAR FORCES VERSUS THERMAL ENERGY

I.F. >>> T.E. → Solid

I.F. ≈ T.E. → Liquid

T.E >>> I.F. → Gas

→ Gas Laws
→ Ideal gas Eqⁿ
→ KTG
→ Ideal & Non-Ideal
→ Vanderwaal gas Eqⁿ
→ Liquid state



Gas Laws

→ Collection of atoms and molecules whose speed depends upon temperature.

⇒ CHARACTERISTICS of Gases

① Pressure = F/A

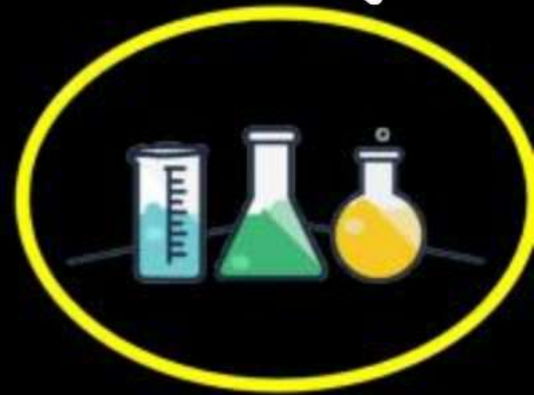
② Volume

③ Temperature

④ Amount of gas

SI-Unit → N/m^2 or Pascal

→ 1 atm ≈ 1 bar = 760 mm of Hg ≈ 76 cm of Hg ≈ 760 torr



② Volume :→ the space occupy by the gas molecules.

S.I. → Unit → meter cube (m^3)

≈ $1\ m^3 = 10^3\ L = 1000\ L$

≈ $1\ L = 1\ dm^3$ (deci-meter cube)

≈ $1\ L = 1000\ ml$

≈ $= 1000\ cm^3$

≈ $= 1000$ cc (Cubic capacity)

$1\ ml = L$?

$1\ L = 1000\ ml$

$\frac{1}{1000} = 1\ ml$

$1\ ml = 10^{-3}\ L$

③ Temperature :- Degree of coldness of hotness of body.

① °C

② Kelvin

③ Fahrenite

④ Rankin ✗

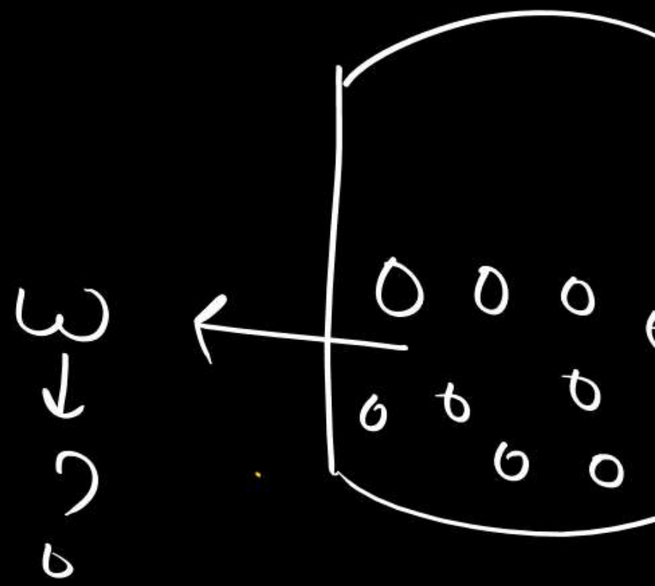
$$°C = \frac{5}{9}(F - 32)$$

$\Rightarrow (t°C + 273.15)K$

$(273.15 - t(K))\ °C$

(4) Amount of Substance → mole (n) = $\frac{\text{given mass}}{\text{Molar mass}}$

Amount of gas (g) = Total amount of gas including mass of container (g) − mass of container (g)



Gas Laws

- Boyle's Law → $n, T = \text{const}$
  $P \propto \frac{1}{V}$
- Charle's Law → $P, n = \text{const}$
  $V \propto T$
- Gaylussac's Law → $V, n = \text{const}$
  $P \propto T$
- Avogadro Law → $P, T = \text{const}$
  $V \propto n$

P, V, T, n

20 June

TEST

NEET

CHEM → 180

Wed

20

720

Q. A Sample of $(NH_4)_3PO_4$ contains 3.18 moles of H- atoms. The no. of moles of Oxygen atoms in the sample.

12 atoms of 'H' → 3.18 moles

4 atoms of 'O' → $\frac{3.18}{12} \times 4$

→ 1.06 mole

thanks
for watching

ARJUNA