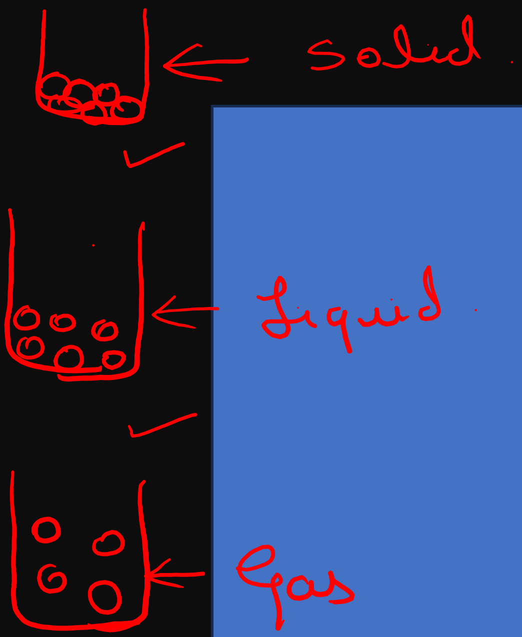
States of Matter.



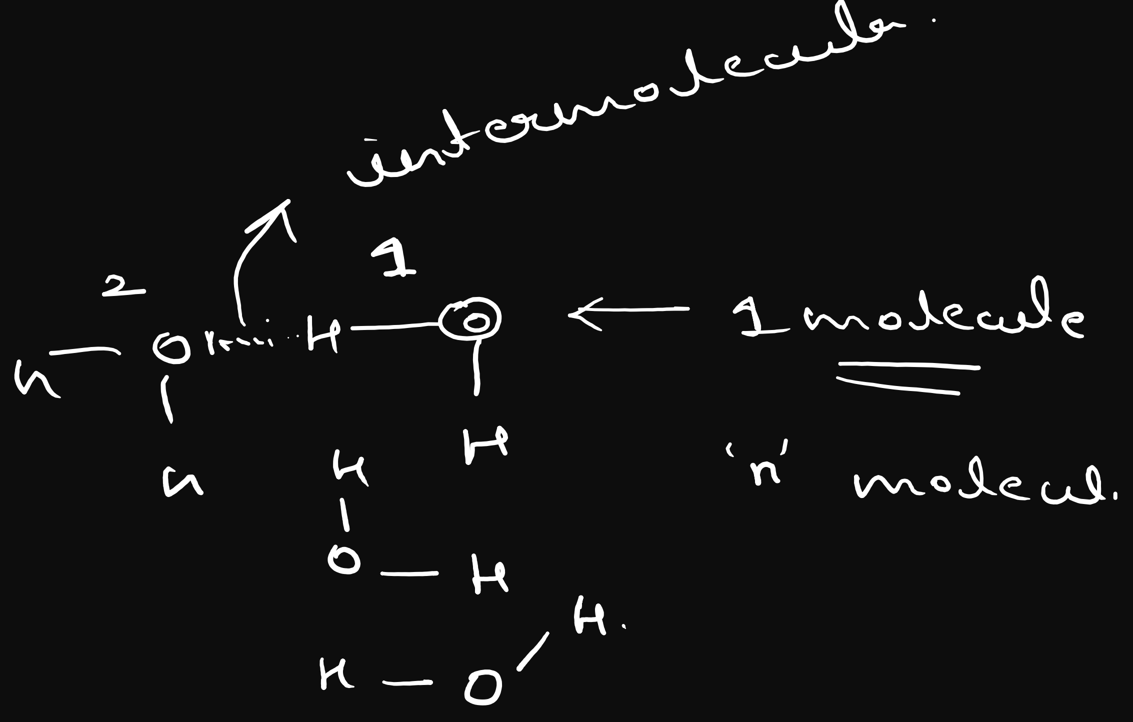
S. No.	Solid state	Liquid state	Gaseous state
1.	Definite shape and volume.	No definite shape. Liquids attain the shape of the vessel in which they are kept.	Gases have neither a definite shape nor a definite volume.
2.	Incompressible	Compressible to a small extent.	Highly compressible
3.	There is little space between the particles of a solid.	These particles have a greater space between them.	The space between gas particles is the greatest.
4.	These particles attract each other very strongly.	The force of attraction between liquid particles is less than solid particles.	The force of attraction is least between gaseous particles.
5.	Particles of solid cannot move freely.	These particles move freely.	Gaseous particles are in a continuous, random motion.

Intermolecular Force.

Intramolecular Force.

inter →

intra →



+ −
+ +

Intermolecular Force

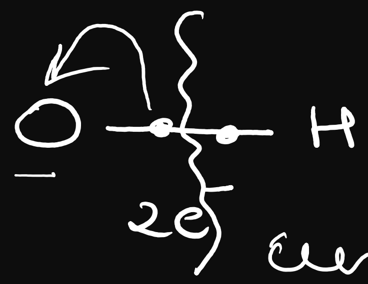
- Attraction
- Repulsion

Van der Waal Forces.

Types →
1) London Force
2) dipole - dipole
3) dipole - induced dipole.

Polar

→ when 2 atom distribute e^- unequal Polar molecule.

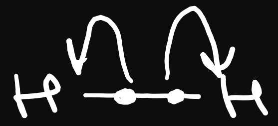


unequal distribution of e^-

$\delta-$ O $\delta+$ H

Non Polar

→ e^- are distributed equally.

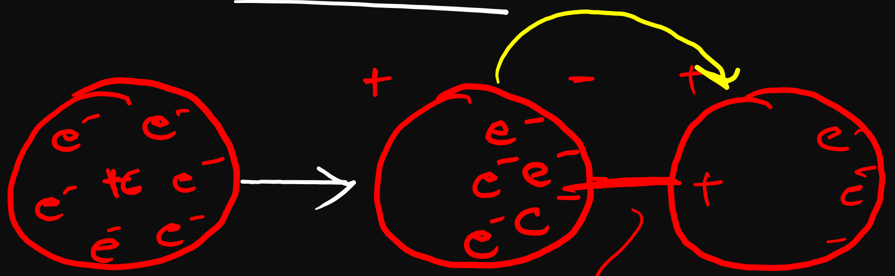


* $\delta-$ O $\delta+$ H → Partial.

$1e = 1.6 \times 10^{-19}$ C

1) London Forces :- temporary effect.

- - → repulsion.



→ temporary effect London forces.

(unequal distribution)

→ Fritz London.

→ dispersion force.

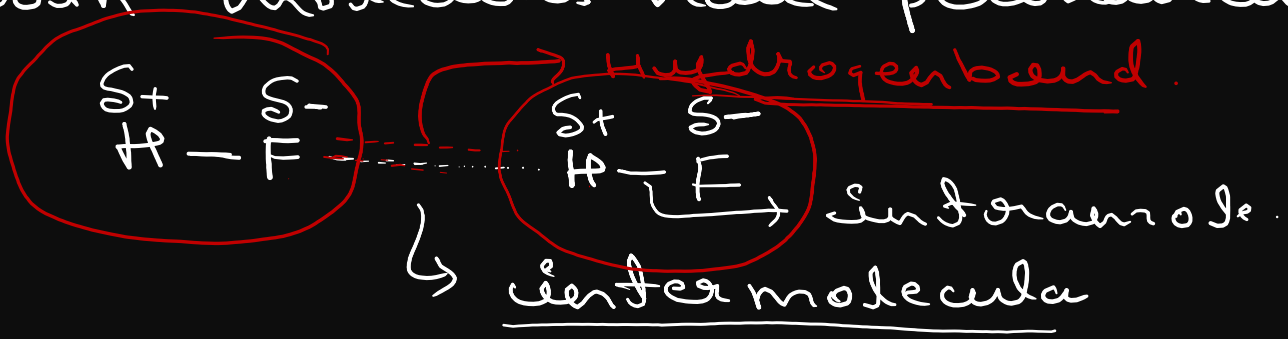
→ Short range force.

$$\text{force} \propto \frac{1}{r^6}$$

→ depends on polarisability of the particle.

2) Dipole - Dipole Force.

→ Both molecules have permanent dipole.



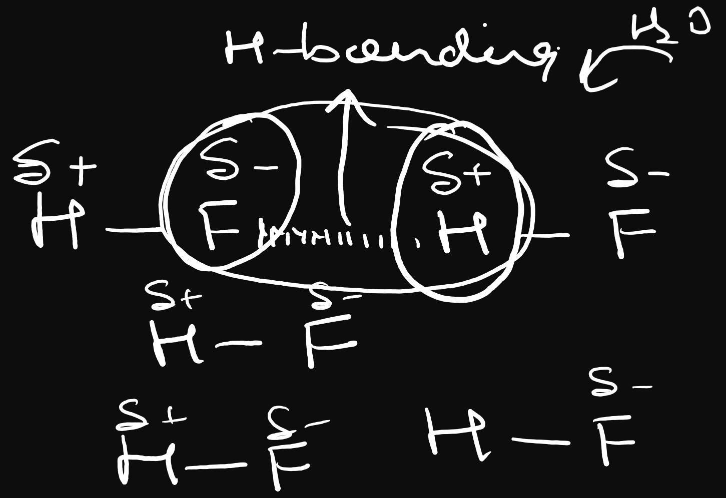
→ Stronger than london forces

→ $F \propto \frac{1}{r^6}$ rotating polar molecules.

$F \propto \frac{1}{r^3}$ Stationary polar molecule.

→ Hydrogen bonding is a dipole - dipole force.

→ why Cl doesn't show H bonding.



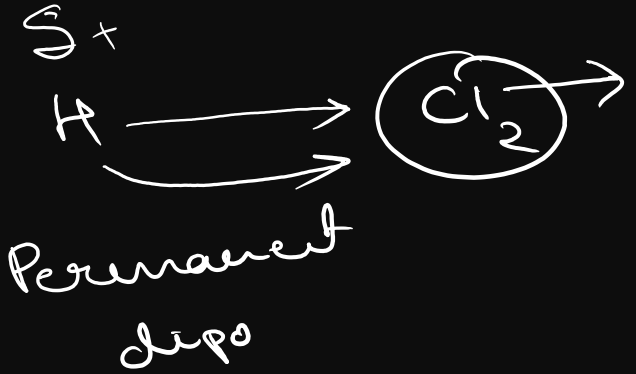
Size of Cl is larger hence doesn't form H bonding.

3) dipole induced dipole

① Permanent dipole ⟶ electrically neutral ator.

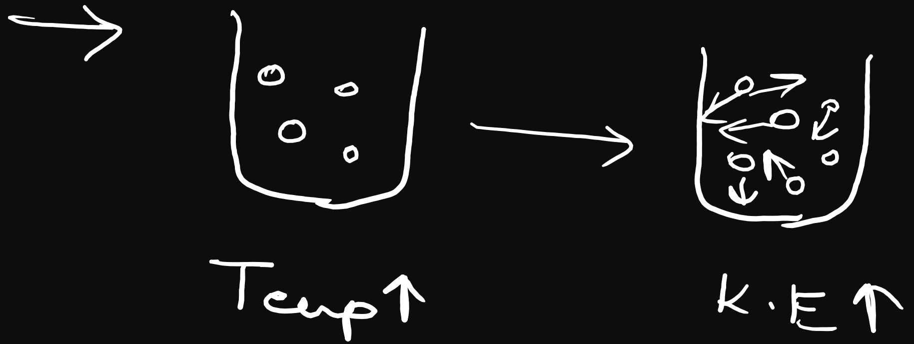
Force $\propto \frac{1}{r^6}$.

$\bar{F}$ ⟶ Cl_2 ⟶



electricall
neutral

Thermal Energy



"Gases"

118 elements

→ 11 gases → elements

Gases Characteristics

P↑ V↓

- → Forces of interaction is weak
- → Gas molecule move about free
- → highly compressible. P↑ compressibility ↑ V↓
- → Gases have lower density
- →

Pressure, Temperature, Volume.

Press

STP → 1 barr
1 atm
760 mmHg.

✓ Volume :- 1L = 1000 ml

✓ $1 L = 1 dm^3 = 10^{-3} m^3$.

✓ $1 m^3 = 10^3 dm^3 = 10^6 cm^3$

Temperature → °C
→ kelvin. 273

$K = °C + 273$

°F and °C

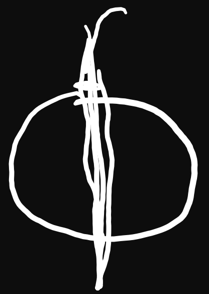
$$\frac{C}{5} = (F-32)/9$$

Pressure :- ↑Force / Area↓

= mass × Acceleration / Area

= density × Volume × Acceleration / Area

= Area × height × density × Acceleration / Area



$$\text{Pressure} = h \rho g$$

$h \rightarrow$ height

$\rho \rightarrow$ density

$g \rightarrow$ acceleration due to gravity

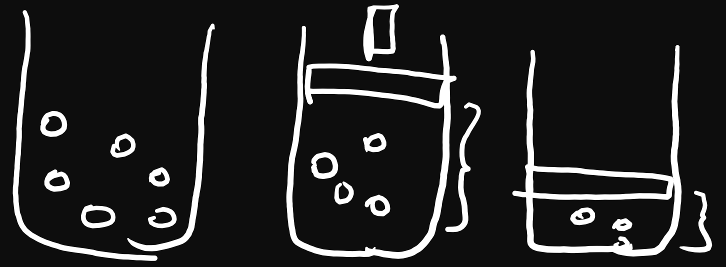
1 atm

760 mm Hg

1 bar

① Boyle's Law :- Temp constant

$P\uparrow \; V\downarrow$

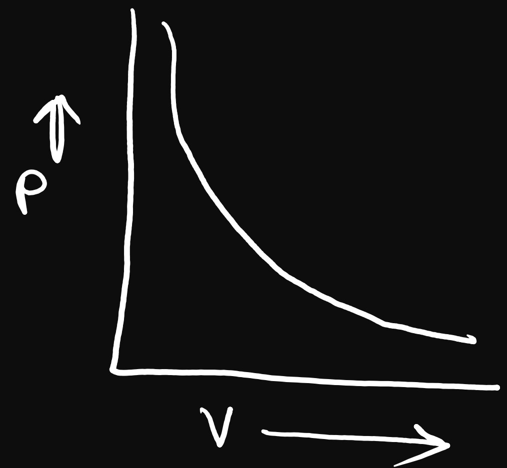


$P\uparrow \; V\downarrow$

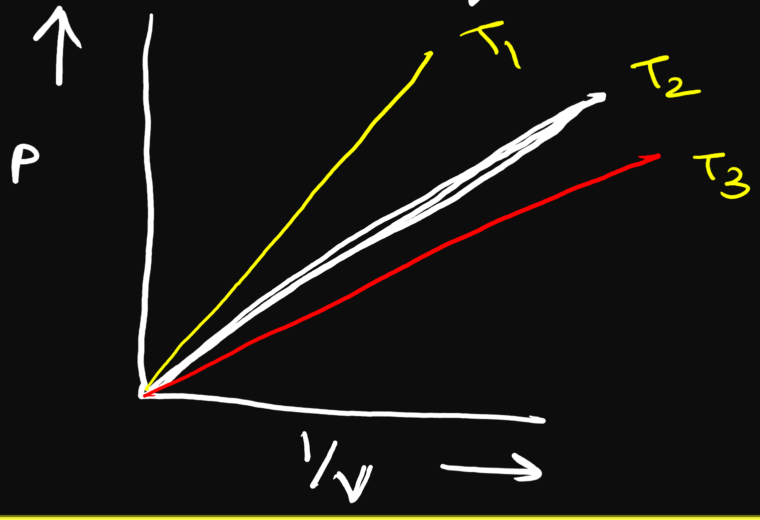
$P \propto \frac{1}{V}$

$P = K \frac{1}{V}$

$PV = K$ (constant)



P vs $\frac{1}{V}$



$$P_1V_1 = P_2V_2$$

Isotherms
(constant temp)

Conclusion:

→ Gases are Compressible.

→ density ∝ Pressure.

$V_1 = 120 ml$

$P_1 = 1.2 bar$

$V_2 = 180 ml$

$P_2 = ?$

$P_1V_1 = P_2V_2$

$P_2 = \frac{P_1V_1}{V_2}$

$= 0.8 bar$

Q) A Vessel of 120 ml capacity contain a certain amount of gas at 35°c and 1.2 bar pressure. The gas is transferred to another Vessel of Volume 180 ml at 35°c what would be its pressure.

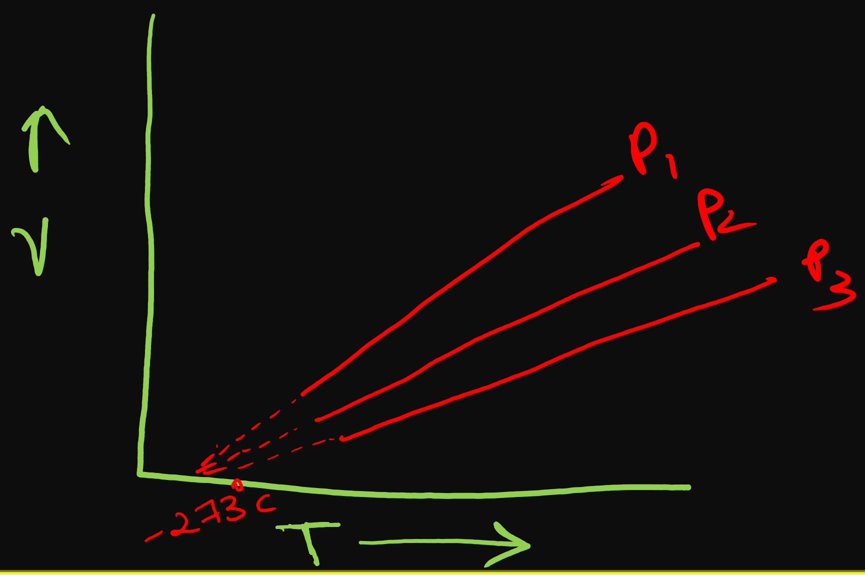
✓ Charles Law :- For a fixed mass at constant pressure.

Volume ∝ Temperature

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

T↓ V↓

T↓ V↓



isobar

The lowest hypothetical or imaginary temp at which gases are supposed to occupy zero volume is called Absolute zero.

On a ship sailing in pacific ocean where temp is 23.4°c a baloon is filled with 2 L air. what will be the volume of the balloon when the ship reaches Indian ocean where temp is 26.1°c.

23.4 + 273 = 296.4

26.1 + 273 = 299.1 K

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_2 = \frac{V_1 T_2}{T_1} = \frac{2 \times 299.1}{296.4}$$

$$= 2.018\ L$$

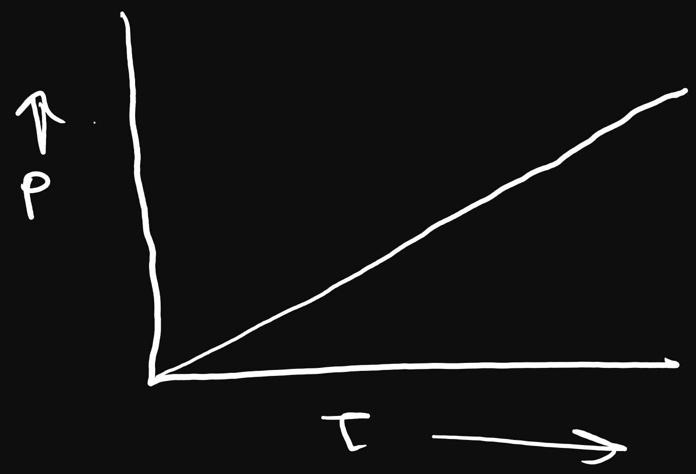
3) Gay Lussac's law. at constant Volume.

$P \propto T$

P↑ T↑.

T↓ P↓.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$



Isochore (Volume constant).

① Boyles law → Temp con — Isotherm. $P \propto \frac{1}{V}$ $P_1V_1 = P_2V_2$

② Charles law → Pressure const — Isobar. $V \propto T$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

③ Gay Lussac Law → Volume const — Isochore $P \propto T$ $\frac{P_1}{T_1} = \frac{P_2}{T_2}$