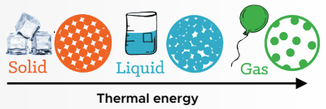
PHYSICS WALLAH

STATES OF MATTER

01

THREE STATES OF MATTER



INTERMOLECULAR FORCES

Weakest - London disperson force
Strongest - Ion dipole
Other 2 types are dipole - dipole & dipole - induced dipole interactions

Q Dipole-induced dipole interactions are present in which of the following pairs?
(A) HCl and He atoms (B) SiF_4 and He atoms
(C) H_2O and alcohol (D) Cl_2 and CCl_4

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GAS LAWS

(1) BOYLE'S LAW (n, T-CONSTANT) $V \propto \frac{1}{P}$ $\boxed{P_1V_1 = P_2V_2}$

(2) CHARLE'S LAW (n, P-CONSTANT) $V \propto T$ $\boxed{\frac{V_1}{T_1} = \frac{V_2}{T_2}}$

(3) COMBINED GAS LAW (n-CONSTANT) $\boxed{\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}}$

(4) GAY LUSSAC'S LAW (n, V-CONSTANT) $P \propto T$ $\boxed{\frac{P_1}{T_1} = \frac{P_2}{T_2}}$

(5) AVOGADRO'S LAW (P-CONSTANT) $V \propto n$ $\boxed{\frac{V_1}{n_1} = \frac{V_2}{n_2}}$

(6) DALTON'S LAW for mixture of Non- reacting gases in container $\boxed{P = P_A + P_B}$
A & B - Non reacting gases

Q If two moles of an ideal gas at 546 K occupy volume 44.8 L, then pressure must be
(A) 2 atm (B) 3 atm (C) 4 atm (D) 1 atm

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IDEAL GAS EQUATION

$\boxed{PV = nRT}$
R = 0.0821 L atm K^{-1} mol^{-1}
R = 8.314 J K^{-1} mol^{-1}
R = 2 cal K^{-1} mol^{-1}

$\boxed{d = \frac{PM}{RT}}$
d = Density of ideal gas

$\boxed{P = CRT}$
C = Concentration

GASES SHOWS IDEAL BEHAVIOUR AT HIGH TEMPERATURE & LOW PRESSURE

Q A gas will approach ideal behaviour at
(A) low T & low P (B) high T & high P
(C)) low T & high P (D) high T & low P

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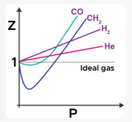
DEVIATION FROM IDEAL BEHAVIOUR



Z = Compressibility F actor
$Z = \frac{PV}{nRT}$ $\boxed{Z = 1, \text{ for ideal gas}}$

REAL GAS OBEYS IDEAL BEHAVIOUR AT BOYLE POINT OR BOYLE TEMPERATURE

Q The compressibility factor of an ideal gas is
(A) 1 (B) < 1 (C) > 1 (D) ∞

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VAN DER WAAL'S EQUATION

$$\left(P + \frac{n^2.a}{V^2}\right)(V - n.b) = n.R.T$$

'a' and 'b' are Vander Waals constants.
unit of a — atm L^2 mol^{-2}
unit of b — L mol^{-1}

$\boxed{\text{ease of liquefaction} \propto \frac{a}{b}}$

Q The value of van der Waal's constant 'a' for the gases O_2, H_2, NH_3 & CO_2 are 1.36, 0.244, 4.17 & 3.59 L^2 atm mol^{-2} respectively. The gas which can most easily be liquefied is
(A) O_2 (B) H_2 (C) NH_3 (D) CO_2

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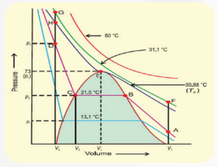
T_c, P_c & V_c



T_c - CRITICAL TEMPERATURE
P_c - CRITICAL PRESSURE
V_c - CRITICAL VOLUME

LIQUEFACTION OF GASES.

A gas can be liquefied by cooling below its critical temperature & applying pressure higher than P_c

Q A gas can be liquefied by
(A) compressing (B) cooling
(C) both (A) and (B) (D) heating

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MOLECULAR SPEEDS

Most probable velocity (α or u_{mp}) $\boxed{\alpha = \sqrt{\frac{2RT}{M}}}$

Average velocity ($\bar{v}$ or u_{av}) $\boxed{\bar{v} = \sqrt{\frac{8RT}{\pi M}}}$

Root mean square velocity (u or u_{rms}) $\boxed{u = \sqrt{\frac{3RT}{M}}}$

Kinetic energy per molecule, K.E = $\frac{3}{2}$ kT where k = Boltzmann constant

Q Average molar kinetic energy of CO and N_2 at same temperature is
(A) $KE_1 = KE_2$ (B) $KE_1 > KE_2$
(C) $KE_1 < KE_2$ (D) can't say anything

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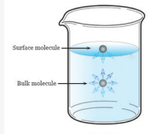
SURFACE TENSION



Surface tension decreases with the increase in temperature
Surface tension increases with the increase in external pressure

Q Raindrops are spherical in shape because of
(A) Capillary (B) Surface Tension
(C) Downward motion (D) Acceleration

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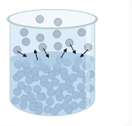
VAPOUR PRESSURE



Vapour pressure is an equilibrium pressure.
Vapour pressure depends only on temperature & nature of liquid.

Q Which of the following will increase with the increase in temperature ?
(A) Surface tension (B) Viscosity
(C) Molality (D) Vapour pressure

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VISCOSITY

As temperature increases viscosity decreases.
As pressure increases viscosity increases.

Q Which of these fluids has the highest viscosity?
(A) Water (B) Honey (C) Blood (D) Air