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

02

GAS LAWS

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

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

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

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

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

(6) DALTON'S LAW for mixture of Non- reacting gases in container $P = P_A + P_B$
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

03

IDEAL GAS EQUATION

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

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

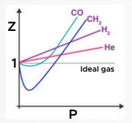
$P = CRT$
C = Concentration

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

04

DEVIATION FROM IDEAL BEHAVIOUR



Z = Compressibility F actor

$Z = \frac{PV}{nRT}$ Z = 1, 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) ∞

05

VAN DER WAAL'S EQUATION

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

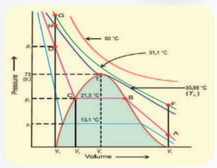
'a' and 'b' are Vander Waals constants.
unit of a — atm L^2 mol^{-2}
unit of b — L mol^{-1}

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

06

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

07

MOLECULAR SPEEDS

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

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

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

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

08

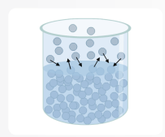
SURFACE TENSION

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

09

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

10

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