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Ideal Gas

35

$$C_3H_6(g) + \frac{9}{2}O_2 \longrightarrow 3CO_2 + 3H_2O(g)$$

$$1 \quad : \quad \frac{9}{2}$$

$$\left(\frac{2}{11}\times 600\right) \quad \left(\frac{9}{11}\times 600\right)$$

$$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$$

$$100 \quad 500\,ml \quad \boxed{300 \quad 400\,ml}$$

Ideal Gas

36

$$N_xO_y + y\,H_2 \longrightarrow \frac{x}{2} N_2 + y\,H_2O(l)$$

$$10\,ml \qquad 10y \qquad 10\,\frac{x}{2} \qquad \times$$

$$10y = 30 \qquad 5x = 10$$

$$\underline{y = 3} \qquad \underline{x = 2}$$

Ideal Gas

S-I

29

100 gm

18 gm H_2O

118 gm H_2SO_4

30 gm

$\frac{18}{100} \times 30$

$= 5.4$ gm

35.4 gm H_2SO_4

34.6 gm H_2O

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Ideal Gas

32

$$C_xH_y + \left(x+\frac{y}{4}\right)O_2 \longrightarrow x\,CO_2 + \frac{y}{2}H_2O(l)$$

$$1 \qquad \left(x+\frac{y}{4}\right) \qquad x \text{ lit}$$

$$x+\frac{y}{4}=6 \qquad x=4$$

$$V \qquad \boxed{V\left(x+\frac{y}{4}\right)=6V} \qquad \boxed{Vx=4V}$$

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Ideal Gas

7

0.1840 gm

$$\left(\frac{758-14}{760}\right)\times\left(\frac{30}{1000}\right)=\underline{n}\times 0.0821\times 287$$

$$\%N=\frac{n\times 28}{0.1840}\times 100$$

Ideal Gas

(14)

$[Co(H_2O)_4 \cdot Cl_2]^+ Cl^- \cdot H_2O + AgNO_3$

$[Co(H_2O)_5 Cl]Cl_2 + 2AgNO_3$

$AgCl$

NaCl

$Na^+ \quad Cl^-$

$CaCl_2 \quad Ca^{2+} \quad 2Cl^-$

$100 \times 0.1 = 10 \text{ mmol}$

$= 6 \times 10^{23} \times 10 \times 10^{-3}$

$= 6 \times 10^{21}$

12×10^{21}

6×10^{21}

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Ideal Gas

15

$0.06M$

$0.042M$

$0.018M$

$N \longrightarrow M$

$$\frac{(0.018) \times \frac{50}{1000} \text{ moles} \times 60}{3}$$

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states of Matter = Ideal Gas + Real gas

state (solid, liq or gas) of a substance depends mainly on following two factors

① Intermolecular attractions

② Translational Kinetic Energy

Difference betn solid / liq / gas

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Properties	Solid	liq	gas
1. Intermolecular attraction	very high	high	low or very low
2) Translational Kinetic Energy	very low	moderate	very high
3) volume	fixed	fixed	not fixed
4) Shape	fixed	not fixed	not fixed/Not defined
5) density	very high	high	low low
6) diffusion nature	very low	moderate	very high

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Ideal Gas

diffusion = tendency to mix up

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Gas Laws

(1) **Boyle's law** :→ At a given temperature, pressure of a given amount of gas is inversely proportional to its volume.

$$P \propto \frac{1}{V} \quad (n \,\&\, T = \text{Const})$$

$$P = \frac{C}{V}$$

$$PV = \text{Const}$$

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Ideal Gas

(11) Charle's law :→ At constant Pressure, Volume of a given amount of gas is directly proportional to its absolute temperature

$$\left(V \propto T \right) \quad (\text{when } n \text{ \& } P = \text{const})$$

$$V = CT$$

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

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Ideal Gas

0°C	1°C	2°C	10°C
273 ml	274 ml	275 ml	283 ml
546 ml	548 ml	550 ml	566 ml

"Vol of a gas increases or decreases by $\frac{1}{273}$ times its volume at 0°C, per degree change in temperature"

Charles's law :

$$V_f = V_0 + \frac{1}{273} V_0 \times t$$

$$V_f = V_0\left(1 + \frac{t}{273}\right) = V_0\left(\frac{273+t}{273}\right)$$

$$V_f = \frac{V_0}{273} T$$

$$V_f \propto T$$

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$$T(K) = 273 + t(^\circ C)$$

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Ideal Gas

Gay-Lussac's law :→ At constant volume, pressure of a given amount of gas is directly proportional to its absolute temperature

$$P \propto T \quad (\text{when } n \,\&\, V = \text{const})$$

$$P = CT$$

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

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Ideal Gas

Avogadro's law :- At constant T, P
Volume of a gas is directly proportional to its moles

$$V \propto n \quad (\text{when } P \,\&\, T = \text{const})$$

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$V \propto \frac{1}{P}$ $(n, T = \text{const})$

$V \propto T$ $(n, P = \text{const})$

$V \propto n$ $(P, T = \text{const})$

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

$V = \frac{nRT}{P}$

$$\boxed{PV = nRT}$$

gas constant

0·0821 atm. lit/mol/K

8·314 J/mol/K

Ideal Gas

① $(2\text{ atm},\ 3\text{ lit}) \longrightarrow (10\text{ atm},\ V)$ $[n, T = \text{const}]$

$$P_1V_1 = nRT = P_2V_2$$

$$P_2V_2 = nRT$$

$$2 \times 3 = 10 \times V$$

$$V = 0.6\text{ lit}$$

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Ideal Gas

2. $(2\,\text{bar}, 3\,\text{lit}, 300\,\text{K}) \longrightarrow (5\,\text{bar}, V, 450\,\text{K})$

$$\frac{P_1V_1}{T_1} = nR = \frac{P_2V_2}{T_2}$$

$$\frac{\cancel{2}\times 3}{\cancel{300}_{\,\cancel{2}}} = \frac{5\times V}{\cancel{450}_{\,3}}$$

$$V = 9/5 = 1.8\,\text{lit}$$

$\overline{P\ V}\ \ \overline{n\ T}$ (with $\underline{P\ V}$ and $\underline{n\ T}$)

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Ideal Gas

Q. During a practical examination, an examiner filled 2 mol gas in a container of volume 8.21 lit at 300 K and asked the students to measure the pressure experimently by manometer.

1. first, pressure was measured by a naughty boy, but before passing it to next student, he secretly opened the contain for few seconds because of which $\frac{1}{10}$th of moles escaped out.

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Ideal Gas

(2) Now it was the turn of a naughty girl. She also measured the pressure but before passing it to next student, she secretly dented the container due to which vol reduced to $3/4^{th}$ of original volume.

(3) Now, it was the turn of an obedient student. He measured it.

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Ideal Gas

(4) After observing all these results, the frusted examiner threw the container inside a furnance of temperature 1200 K.

find Pressure measure by each student and final pressure of container.

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Ideal Gas

S – I
O – I
J – M

Done

J – Adv

Conc terms