

## Ideal Gas

(35)



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

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



100

500 ml

300	400 ml
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## Ideal Gas

(36)



10ml

(10 $\gamma$ )10  $\frac{x}{2}$ 

X

$$10\gamma = 30$$

$$\gamma = 3$$


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$$5x = 10$$

$$x = 2$$


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## Ideal Gas

S-I  
(29)

100 gm

18 gm  $H_2O$

118 gm  $H_2SO_4$

30 gm

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

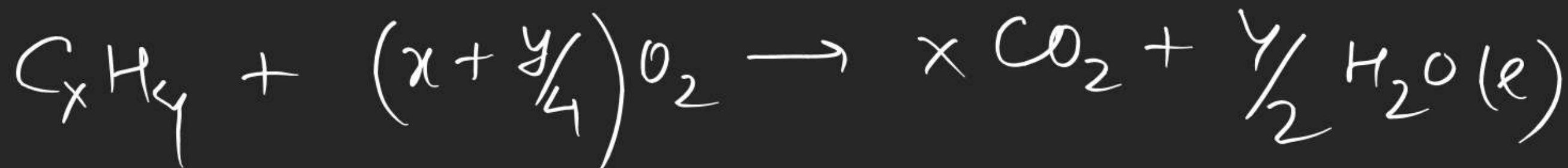
$$= 5.4 \text{ gm}$$

35.4 gm  $H_2SO_4$

34.6 gm  $H_2O$

## Ideal Gas

(32)



1

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

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

$$x = 4$$

V

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

$$Vx = 4V$$

## Ideal Gas

(7)

0.1840 gm

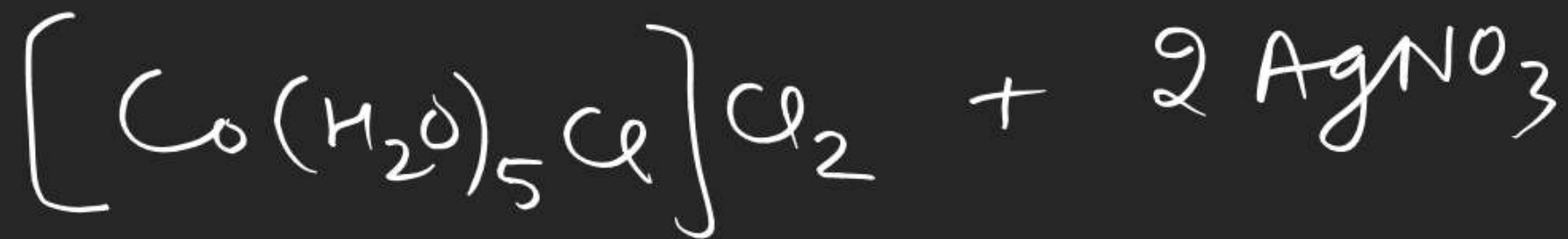
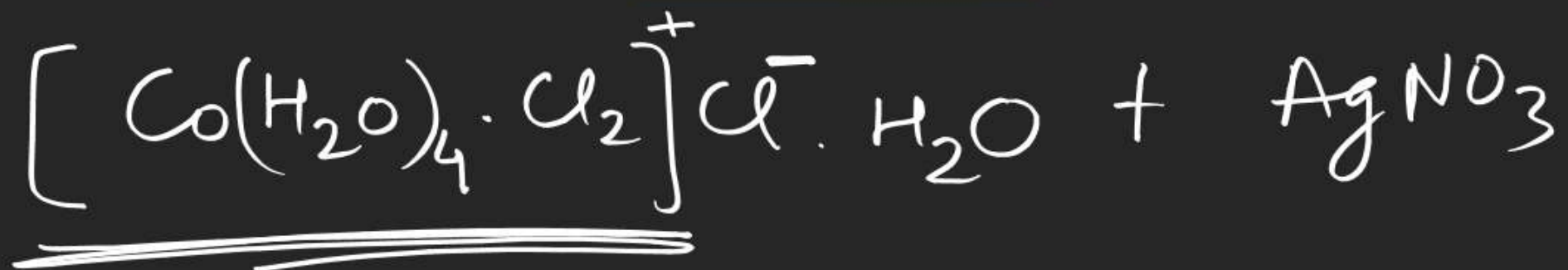
$$\left( \frac{758-14}{760} \right) \times \left( \frac{30}{1000} \right) = \underline{n} \times 0.0821 \times 287$$

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



## Ideal Gas

(14)



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

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

$$\underline{\underline{= 6 \times 10^{21}}}$$



$$12 \times 10^{21}$$

$$\underline{\underline{6 \times 10^{21}}}$$

## Ideal Gas

150.06 M0.042 M0.018 MN → M

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

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3

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 bet<sup>n</sup> solid / liq / gas



Properties	Solid	liq	<u>gas</u>
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 <u>nature</u>	<u>very low</u>	moderate	very high

# Ideal Gas



diffusion = tendency to mix up



# 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**

② Charles's law :  $\rightarrow$  At constant Pressure, Volume of a given amount of gas is directly proportional to its absolute temperature  
( $V \propto T$ ) (when  $n$  &  $P = \text{const}$ )  
 $V = CT$   
 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$



## Ideal Gas

$0^{\circ}\text{C}$	$1^{\circ}\text{C}$	$2^{\circ}\text{C}$	$10^{\circ}\text{C}$
<u>273ml</u>	274ml	275ml	283ml
<u>546ml</u>	548ml	550ml	566ml

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

Charles' law:

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

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

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

$$V_f \propto T$$



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

## Ideal Gas

Gay-Lussac's law :  $\rightarrow$  At constant volume,  
Pressure of a given amount of  
gas is directly proportional  
to its absolute temperature

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

$$P = CT$$

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

## Ideal Gas

Avogadro's law :- At constant  $T, P$   
Volume of a gas is directly  
proportional to its moles  
 $V \propto n$  (when  $P \& T = \text{const}$ )

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

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

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

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

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

$$PV = nRT$$

gas constant

$$0.0821 \text{ atm.lit/mol/K}$$

$$8.314 \text{ J/mol/K}$$

**Ideal Gas**

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

$$P_1 V_1 = nRT = P_2 V_2$$

$$P_2 V_2 = nRT$$

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

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



## Ideal Gas

$$\textcircled{2} \quad (2 \text{ bar}, 3 \text{ lit}, 300 \text{ K}) \rightarrow (5 \text{ bar}, V, 450 \text{ K})$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

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

$$V = \frac{9}{5} = 1.8 \text{ lit}$$

$$\frac{P}{T} = \frac{V}{n}$$

## 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 experimentally by manometer.

1. first, pressure <sup>was</sup> 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.

## 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  $\frac{3}{4}$ th of original volume.
- ③ Now, it was the turn of an obedient student. He measured it.



## Ideal Gas

- ④ After observing all these results, the frustrated examiner threw the container inside a furnace of temperature  $1200\text{ K}$ .  
find pressure measure by each student  
and final pressure of container.

## Ideal Gas

$S-I$   
 $O-I$   
 $J-M$  } Done

J-Adv conc terms