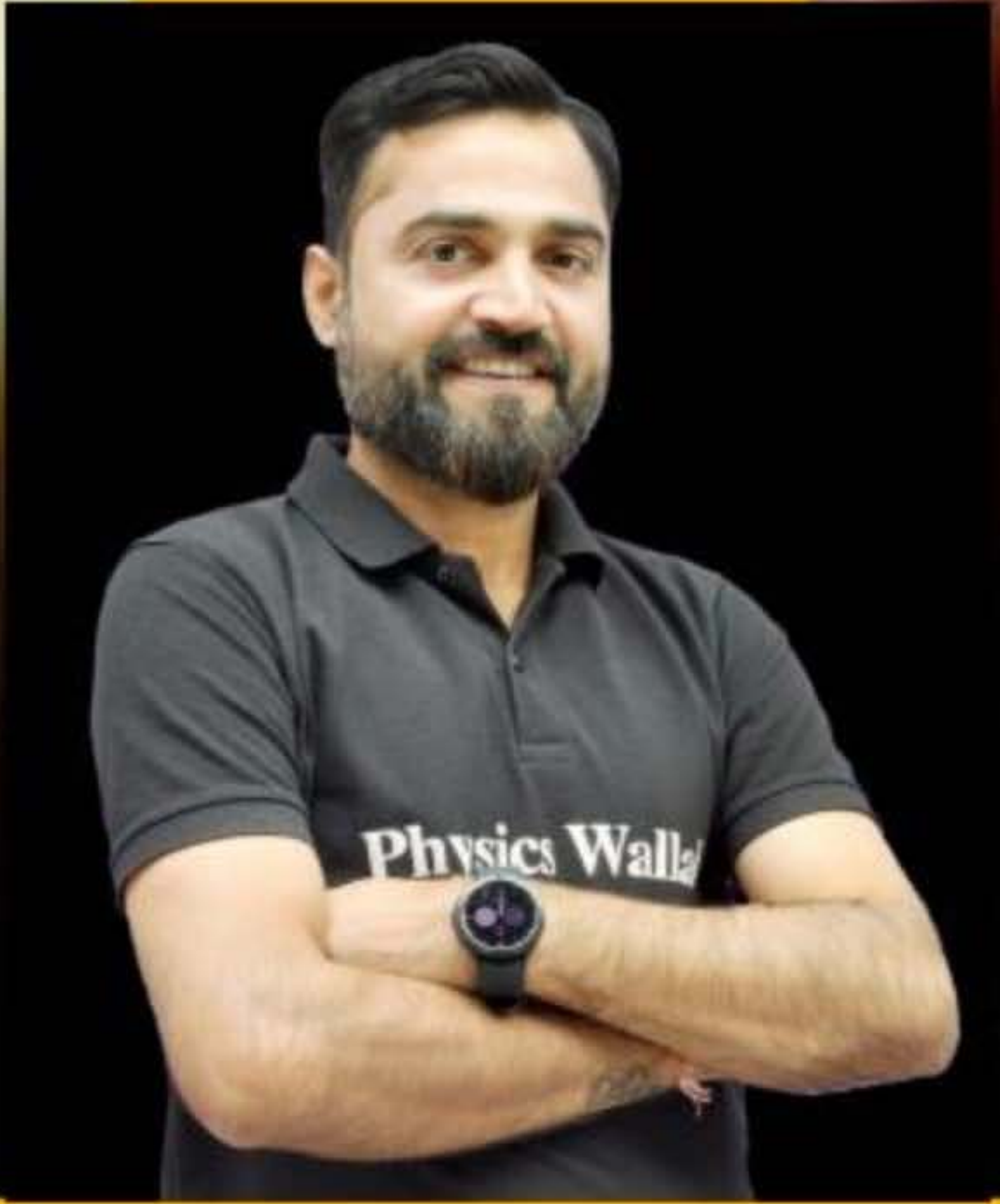
YAKEEN 4.0

NEET 2024

Chemistry

Some basic concepts of chemistry



Lecture No.- 3

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Topics to be covered

1. REVISONOF PREVIOUS CLASS
2. Volume of gas at NTP / STP
3. Molecular weight of mixture
4. PYQ practice

REVISION

CO_2 CH_4

\# Molecular weight (amu) $\longrightarrow$ 1 molecule

Molecular weight (gram) $\longrightarrow$ 1 mole (6.02×10^{23}) molecules

Homework

$A = p + n$

$12 = 6 + n$

$n = 6$

$16 = 8 + n$

$n = 8$

1.8×10^{23} **Q1** Cal. no. of Atoms in 9.5 gm $MgCl_2$.

6×10^{22} **Q2** Cal. no. of H-atoms in 6.3 gm HNO_3.

6×10^{23} **Q3** Cal. no. of protons in 1.7 gm NH_3.

$22 \times 6 \times 10^{22}$ **Q4** Cal. no. of neutrons in 4.4 gm CO_2.

(3) $NH_3 = 14 + 3 = 17$

17 gm $NH_3 \longrightarrow 6 \times 10^{23}$ molecules

1.7 gm $NH_3 \longrightarrow \frac{6 \times 10^{23}}{\cancel{17}} \times \frac{\cancel{17}}{10^1}$

6×10^{22} molecules

$\downarrow \times 10$

$6 \times 10^{23}\ p$

NH_3

$7p + 3p = 10p$

(4) $CO_2 \rightarrow 12 + 32 = 44$

44 gm $CO_2 \longrightarrow 6 \times 10^{23}$ molecules

4.4 gm $CO_2 \longrightarrow \frac{6 \times 10^{23}}{\cancel{44}} \times \frac{\cancel{4.4}}{10^1}$ molecules $\Rightarrow$ 6×10^{22} molecules CO_2

$22 \times 6 \times 10^{22}\ n$

CO_2

$6n + 16n = 22n$

STP & NTP

Standard Temperature & Pressure	Normal temperature & Pressure
$T = 0^\circ C = 273\,K$	$T = 20^\circ C = 293\,K$
$P = 1$ Bar	$P = 1$ atm

For gases

$$\boxed{PV = nRT}$$

P = pressure of gas

V = Volume of gas

n = no. of moles of gas

R = gas constant

T = temp. of gas

$$\boxed{R = 0.0821\ \text{atm L mol}^{-1}\text{K}^{-1}}$$

Q. Cal. volume occupied by 1 mole of a gas at NTP.

$V = ?$

$n = 1$

$T = 293\ K$

$P = 1\ atm$

$$PV = nRT$$

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

$$V = \frac{1 \times 0.0821 \times 293}{1}\ L$$

$$\boxed{1\ atm \approx 1.013\ bar}$$

$$\boxed{V = 22.4\ L}$$

⊛ One mole of a gas at NTP | STP will always occupy 22.4 L volume

Question

What is 1 amu ?

A) Weight of 1 H atom

B) 1/12 x weight of 1 C-12 atom

C) 1/12 x weight of 1 C-14 atom

D) 1/16 x weight of 1 O-16 atom

Q. Cal. the volume occupied by 3 mol $H_2(g)$ at NTP.

$$1 \text{ mol } H_2(g) \longrightarrow 22.4 \text{ L volume at NTP}$$

$$3 \text{ mol } H_2(g) \longrightarrow \frac{22.4}{1} \times 3 \text{ L}$$

$$67.2 \text{ L}$$

Accha Baccha

Cal. the volume occupied by 8.8 gm $CO_2(g)$ at NTP.

CO_2

↓

12+32

↓

44 gm

$$44 \text{ gm } CO_2 \longrightarrow 22.4 \text{ L volume at NTP}$$

$$8.8 \text{ gm } CO_2 \longrightarrow \frac{22.4}{\cancel{44}} \times \frac{\overset{2}{\cancel{8.8}}}{10} \text{ L volume}$$

$$\frac{44.8}{10} \text{ L}$$

$$4.48 \text{ L}$$

AIIMS PATNA

Cal. the weight of 2.24L $NH_3(g)$ at NTP.

NH_3

$14+3 = 17$ gm

22.4 L volume $\longrightarrow$ 1 mol NH_3 (g)

22.4 L volume $\longrightarrow$ 17 gm NH_3 (g)

2.24 L volume $\longrightarrow$ $\dfrac{17}{\cancel{22.4}} \times \dfrac{\cancel{2.24}}{10}$ gm NH_3

1.7 gm NH_3

AIIMS BATHINDA

Calculate the volume occupied by 3.2 gm CH_4 (g) at STP.

$1 \text{ mol } CH_4 \longrightarrow 22.4\ L$ volume at STP

$16 \text{ gm } CH_4 \longrightarrow 22.4\ L$ volume

$3.2 \text{ gm } CH_4 \longrightarrow \frac{22.4}{\cancel{16}} \times \frac{\overset{2}{\cancel{3.2}}}{10}$ L volume

CH_4
$\downarrow$
$12+4$
$\downarrow$
16gm

$\frac{44.8}{10}\ L \Rightarrow 4.48L$

Q Cal. the weight of 6.72 L $O_2(g)$ at NTP/STP.

$22.4\text{ L volume} \longrightarrow 32\text{ gram } O_2$

$6.72\text{ L} \longrightarrow \dfrac{32}{\cancel{22.4}} \times \dfrac{\cancel{67.2}\ 3}{10}$

$\dfrac{96}{10} \rightarrow 9.6\text{ gm } O_2$

AIIMS GORAKHPUR

Cal. no. of molecules in 2.24 L $CO_2(g)$ at NTP.

22.4 L volume ⟶ 1 mol CO_2

22.4 L volume ⟶ 6×10^{23} molecules CO_2

2.24 L volume ⟶ $\dfrac{6\times10^{23}}{\cancel{22.4}} \times \dfrac{\cancel{2.24}}{10^{1}}$

6×10^{22} molecules CO_2

AIIMS BHOPAL

Cal. total no. of atoms in 4.48 L $NH_3(g)$ at NTP.

22.4 L volume $\longrightarrow$ 6×10^{23} molecules of NH_3

4.48 L volume $\longrightarrow$ $\frac{6\times10^{23}}{\cancel{22.4}} \times \frac{\overset{2}{\cancel{44.8}}}{10}$ molecules of NH_3

1.2×10^{23} molecules NH_3

$\xrightarrow{\times 4}$

4.8×10^{23} atoms

AIIMS JUPITER

Which of the following contains minimum no. of atoms ?

A) 11 gm CO_2 (4.5×10^{23})

B) 3×10^{24} molecules of NH_3 (12×10^{24})

C) 4.48 L $N_2(g)$ at NTP (2.4×10^{23})

D) 0.1 mol $CH_4(g)$ (3×10^{23})

D) 1 mol $CH_4 \longrightarrow 6\times10^{23}$ molecules CH_4

0.1 mol $CH_4 \longrightarrow \frac{6\times10^{23}}{1}\times0.1$ molecule

6×10^{22} molecules CH_4

$\downarrow \times 5$

30×10^{22} atom

3×10^{23} atoms

$$\text{no. of moles of molecules} = \frac{\text{Given weight}}{\text{Molecular weight}}$$

Q Cal. no. of moles of CH_4 in 48 gm CH_4.

CH_4

$12+4 = 16\text{gm}$

16 gm CH_4 $\longrightarrow$ 1 mole CH_4 molecule

48 gm CH_4 $\longrightarrow$ $\frac{1 \times 48}{16}$ mole CH_4

Molecular weight of mixture

It represents weight of 1 mole mixture in gram.

Molecular wt. $\longrightarrow$ gram $\longrightarrow$ 1 mole

Q

$H_2 + CH_4$

2 mole, 2 mole

Cal. molecular weight of mixture.

$$n_{Total} = n_{H_2} + n_{CH_4}$$
$$= 2 + 2$$
$$\boxed{n_{Total} = 4 \text{ mol}}$$

$$w_{Total} = 4 + 32$$
$$= 36 \text{ gm}$$

4 mol mixture $\longrightarrow$ 36 gram

1 mol mixture $\longrightarrow$ $\frac{\cancel{36}^{9} \times 1}{\cancel{4}}$ gram

9 gram

Mol. wt of mixture = 9

AIIMS HYDERABAD

A vessel contains 1 mol of $O_2(g)$ & 2 moles of $N_2(g)$.
Cal. molecular weight of mixture.

32		28
O_2	+	N_2
1 mol		2 mol

$n_{Total} = 1 + 2 = 3$

$w_{Total} = 32 + 56 = 88$ gram

3 mol mixture ⟶ 88 gram

1 mol mixture ⟶ $\frac{88}{3} \times 1$ gram

29.3 gram

Q

$CO_2(g) = 88$ gm
$+$
$CH_4 = 64$ gm

Cal. molecular weight of mixture.

$w_{Total} = 88 + 64 = 152$ gram

$n_{Total} = n_{CO_2} + n_{CH_4}$

$$n_{Total} = \frac{88}{44} + \frac{64}{16}$$

$$= 2 + 4 = 6 \text{ mole}$$

6 mole mixture $\longrightarrow$ 152 gram

1 mol mixture $\longrightarrow \frac{152 \times 1}{6}$ gram

25.3 gram

Revision

At NTP|STP, 1 mole of a gas always occupies 22.4 L volume

Molecular wt. of mixture —→ wt. of 1 mole mixture in grams

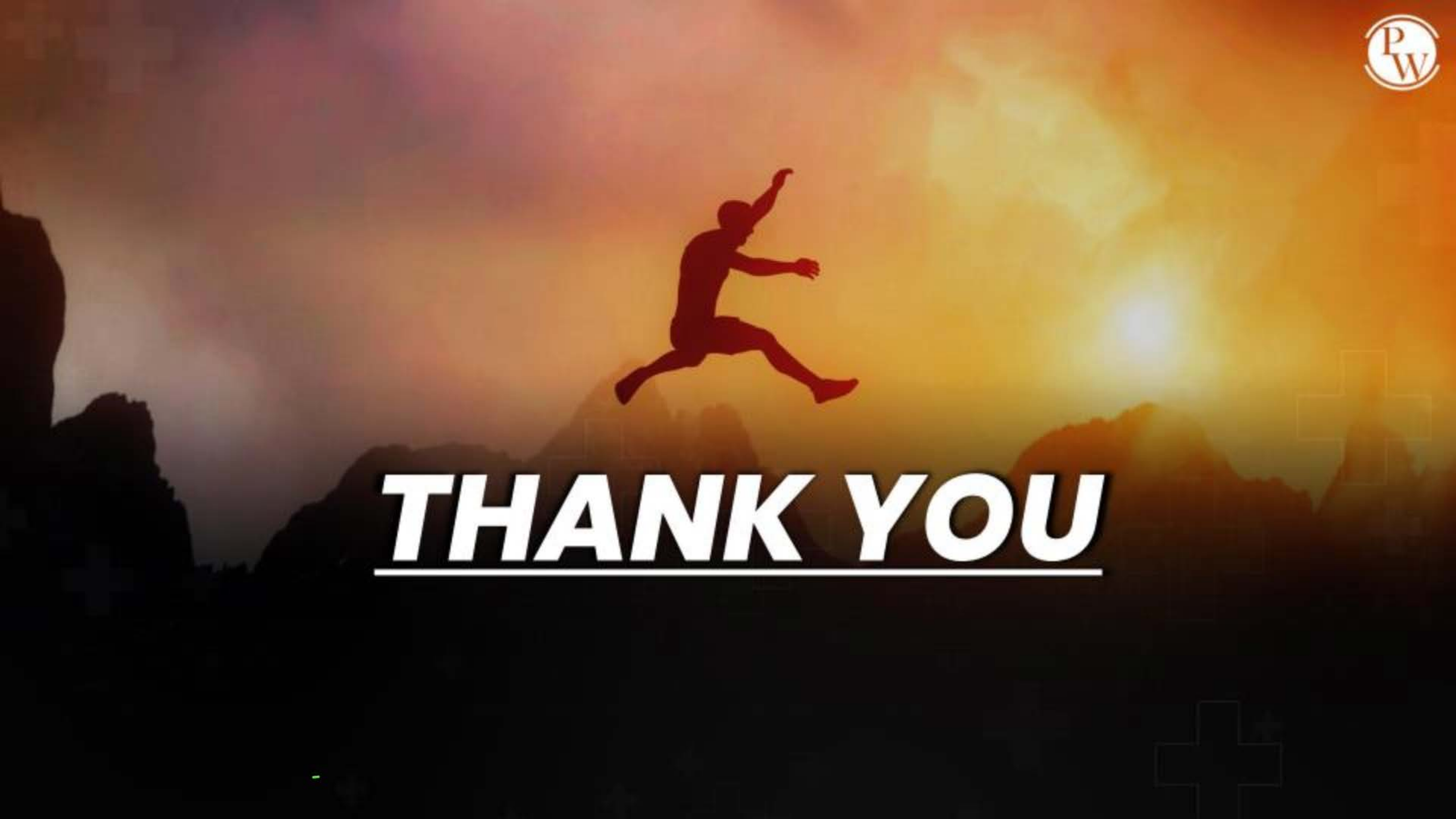
Homework

Q1 Cal. a) no. of molecules
b) weight in gram of 1.12 L $CH_4(g)$ at NTP
c) no. of atoms

Q2

$$\boxed{\begin{array}{cc} H_2 & + \; N_2 \\ \downarrow & \downarrow \\ 6\text{ gm} & 28\text{ gm} \end{array}}$$

Cal. molecular wt. of mixture.


THANK YOU