

Class: 9
DIT Foundation Plus

4. Stoichiometry

Atomic Weight, Molecular weight and GMW
Teaching Task.

Q1) Ans:- B

Solution:- CaCl_2 , 1 mole $\text{GMW} = 40 + 71 = 111 \text{ gms}$.

For 222 gms CaCl_2 is 2 moles.

For 1 mole of $\text{CaCl}_2 \rightarrow \text{Ca}^{+2} \rightarrow \text{N}$.

For 2 moles of $\text{CaCl}_2 \rightarrow \text{Ca}^{+2} \rightarrow \underline{2\text{N}}$.

For 1 mole of $\text{CaCl}_2 \rightarrow 2\text{Cl}^- \rightarrow 2\text{N}$.

For 2 moles of $\text{CaCl}_2 \rightarrow \underline{4\text{N}}$.

Q2) Ans:- A

Solution:- Equal no. of moles have Equal no. of molecules.

1) 16 gms of O_2 & 14 gms of N_2

'n' of $\text{O}_2 = \frac{16}{32} = \frac{1}{2}$ moles. 'n' of $\text{N}_2 = \frac{14}{28} = \frac{1}{2}$ ✓

2) 8 gms of O_2 & 22 gms of CO_2

'n' of $\text{O}_2 = \frac{8}{32} = \frac{1}{4}$ moles, 'n' of $\text{CO}_2 = \frac{22}{44} = \frac{1}{2}$ moles

3) 28 gms of N_2 & 22 gms of CO_2

'n' of $\text{N}_2 = \frac{28}{28} = 1$ mole, 'n' of $\text{CO}_2 = \frac{22}{44} = \frac{1}{2}$ moles.

4) 32 gms of O_2 & 32 gms of N_2

n of $\text{O}_2 = \frac{32}{32} = 1$ mole, 'n' of $\text{N}_2 = \frac{32}{28}$

Q3) Ans:- A

Solution:- $\text{SO}_2\text{Cl}_2 = 32 + 32 + 71 = 135 \text{ gms}$

1 mole $\rightarrow$ 135 gms.

2 mole $\rightarrow$ 13.5 gms.

$$135x = 13.5$$

$$x = \frac{13.5}{135} = 0.1 \text{ moles}$$

Q4) Ans:- A

Solution:- No. of atoms in $\text{C}_{12}\text{H}_{22}\text{O}_{11} = 12 + 22 + 11 = 45$

Total no. of atoms in one mole =

$$\begin{aligned} & \text{Total no. of atoms in Molecule} \times N_A \\ & = 45 \times 6.023 \times 10^{23} \text{ atoms/mole} \end{aligned}$$

Q5) Ans:- D

Solution:- For 1 mole of PCl_3 , 4 atoms are present -

$$1 \text{ mole} = 4 \times 6.023 \times 10^{23} \text{ atoms}$$

$$1.4 \text{ moles} = x$$

$$x = 1.4 \times 6.023 \times 10^{23} \times 4 = 33.6 \times 10^{23}$$

$$= 3.36 \times 10^{24} \text{ atoms}$$

Q6) Ans:- C

Solution:- The molecular weight of H_2O_2 is 34 amu.

Weight of H_2O_2 is 34 gms

Q7) Ans:- B

Solution:- No. of electrons $H_2 = 2e^-$

The no. of atoms present in 1 mole of Hydrogen
mole = $2 \times 6 \times 10^{23} = 12 \times 10^{23}$ electrons

Q8) Ans:- A

Solution:- No. of moles $\propto$ No. of molecules.

1) 34gms of water

$$n = \frac{34}{18} = 1.88 \text{ moles.} \quad \checkmark$$

2) 28gms of CO_2

$$n = \frac{28}{44} = 0.636 \text{ moles}$$

3) 46gms of CH_3OH

$$n = \frac{46}{32} = 1.43 \text{ moles.}$$

4) 54gms of N_2O_5

$$N_2O_5 = 28 + 80 = 108.$$

$$n = \frac{54}{108} \times \frac{1}{2} = 0.5 \text{ moles}$$

Maximum no. of molecules in 34gms of water

Q9) Ans:- B

Solution:- For 1 mole $Na_2O = (23 \times 2) + 16 = 46 + 16 = 62 \text{ gms.}$

$$\begin{array}{l} 1 \text{ mole} \rightarrow 62 \text{ g} \\ x \rightarrow 620 \text{ gms} \end{array} \Rightarrow \begin{array}{l} 62x = 620 \\ x = 10 \text{ moles} \end{array}$$

Q10) Ans:- D

Solution:- For 1 mole $\text{CO}_2 = 44 \text{ gms}$ have 2 N atoms of Oxygen.

$$44 \text{ gms} \rightarrow 2 \times 6 \times 10^{23}.$$

$$88 \text{ gms} \xrightarrow{\times 2} x$$

$$44x = 88 \times 2 \times 6 \times 10^{23}.$$

$$x = \frac{88 \times 2 \times 6 \times 10^{23}}{44} = 24 \times 10^{23} \text{ atoms}.$$

For CO , 1 mole = $12 + 16 = 28 \text{ gms}$.

$$28 \text{ gms} \rightarrow 6 \times 10^{23} \text{ atoms of oxygen}.$$

$$x \xrightarrow{\times 2} 2 \times 6 \times 10^{23} \text{ atoms of oxygen}.$$

$$6 \times 10^{23} x = 28 \times 2 \times 6 \times 10^{23}$$

$$x = 112 \text{ gms of CO}.$$

Advanced Level Questions

Q11) Ans:- B

Solution:- For Hydrogen $2 \text{ gms} \rightarrow 6 \times 10^{23} \times 2 \text{ atoms}.$

$$x \xrightarrow{\times 2} 1$$

$$12 \times 10^{23} x = 2 \text{ gms}.$$

$$x = \frac{2}{612 \times 10^{23}} = 0.16 \times 10^{-23} \text{ gms}.$$

For Helium, $4 \text{ gms} \rightarrow 6 \times 10^{23} \text{ atoms}$

$$x \rightarrow 1 \text{ atom}$$

$$6 \times 10^{23} x = 4$$

$$x = \frac{4}{6 \times 10^{23}} = 4 \times 0.166 \times 10^{-23} \checkmark$$
$$= 4 \times 1.66 \times 10^{-24} \text{ gms}.$$

Q12) Ans:- C

Solution:- 1 mole $\text{NH}_3 = 14 + 3 = 17 \text{ gms}$

1 mole = 17 gms $\rightarrow 6 \times 10^{23}$ molecules of NH_3
 $\times \rightarrow 1$ molecule

$$6 \times 10^{23} x = 17$$

$$x = \frac{17}{6 \times 10^{23}}$$

$$= 17 \times 0.166 \times 10^{-23}$$

$$= 17 \times 1.66 \times 10^{-24} \text{ gms.}$$

Q13) Ans:- B

Solution:- 1 a.m.u = $1.67 \times 10^{-24} \text{ gms}$

amu is the smallest unit of mass used to measure the masses of atoms.

Q14) Ans:- E

Solution:- CO_2 , 1 mole = 44 gms

at STP, 44 gms $\rightarrow 22.4$ litres. ✓

1 mole of a gas at STP occupies 22.4 litres, is called gram molecular volume.

A & R both are incorrect

Q15) Ans:- C

Solution:- The no. of gram atoms of hydrogen present in 1 gram molecule of methane (CH_4) gas is 4.

Q16) Ans: D

Solution: $n \propto N$

1) SO_2 , $n = \frac{100}{64} = 1.56 \text{ moles}$

2) O_2 , $n = \frac{100}{32} = 3.125 \text{ moles}$

3) He , $n = \frac{100}{4} = 25 \text{ moles}$

4) H_2 , $n = \frac{100}{2} = 50 \text{ moles}$

100 gms of H_2 have maximum No. of molecules.

Q17) Ans: A

Solution: $\text{SO}_2 = 32 + 32 \text{ gms} = 64 \text{ gms}$

$64 \text{ gms} \rightarrow 6 \times 10^{23} \text{ molecules}$

$x \rightarrow 1 \text{ molecule}$

$6 \times 10^{23} x = 64$

$x = \frac{64^{10.66}}{6 \times 10^{23}} = 10.66 \times 10^{-23} \text{ gms}$

For methane molecule, $\text{CH}_4 = 12 + 4 = 16 \text{ gms}$

$16 \text{ gms} \rightarrow 6 \times 10^{23} \text{ molecules}$

$10.66 \times 10^{-23} \text{ gms} \Rightarrow 'x' \text{ molecules}$

$16x = 10.66 \times 10^{-23} \times 6 \times 10^{23}$

$x = \frac{10.66 \times 6}{16} = 3.99 \text{ molecules}$

Nearly 4 molecules of methane

Integer Type.

Q18) Ans:- 5

Solution:- For 1 mole water = 18 gms

$$1 \text{ mole} \rightarrow 18 \text{ gms}$$

$$x \text{ moles} \rightarrow 90 \text{ gms}$$

$$18x = 90$$

$$x = \frac{90}{18} \text{ moles} = 5 \text{ moles.}$$

Q19) Ans:- 30

Solution:- At S.T.P 1 mole gas = 22.4 litres

$$1 \text{ mole} \rightarrow 22400 \text{ mL.}$$

$$x \text{ moles} \rightarrow 200 \text{ mL.}$$

$$22400x = 200$$

$$x = \frac{2}{224} \text{ moles.}$$

The gas which has weight 0.268 gms for $\frac{2}{224}$ moles.

$$0.268 \text{ gms} \rightarrow \frac{2}{224} \text{ moles}$$

$$x \rightarrow 1 \text{ mole}$$

$$\frac{2}{224} x = 0.268$$

$$x = \frac{0.268 \times 224}{2} = 30.016 \text{ gms}$$

Matrix Matching

Q20) Ans:- a) 3. b) 1 c) 4. d) 2

Solution:-

a) 2.3 gms of Na $\rightarrow$ 3) 1 mole Na = 23 gms.
 $x \xrightarrow{\quad} = 2.3 \text{ gms}$

$$23x = 2.3$$

$$x = \frac{2.3}{23} = 0.1 \text{ moles}$$

b). 3×10^{23} molecules of $\text{CO}_2 \rightarrow$ 1) 1 mole of $\text{CO}_2 \rightarrow 6 \times 10^{23}$ molecules
 $x \xrightarrow{\quad} = 3 \times 10^{23} \text{ molecules}$

$$\frac{6 \times 10^{23}}{2} x = 3 \times 10^{23}$$

$$x = \frac{1}{2} = 0.5 \text{ mole}$$

c) 1.12 lit of H_2 at STP $\rightarrow$ 4) 1 mole $\rightarrow$ 22.4 litres

$$x \text{ moles} \rightarrow 1.12 \text{ litres}$$

$$22.4 x = 1.12$$

$$x = \frac{1.12}{22.4} = 0.05 \text{ moles}$$

d) 8 gms of $\text{O}_2 \rightarrow$ 2) 1 mole of $\text{O}_2 = 32$ grams

$$x \xrightarrow{\quad} = 8 \text{ grams}$$

$$32x = 8$$

$$x = \frac{8}{32} = 0.25 \text{ moles}$$

Learners Task.

Q1) Ans:- A

Solution:- $1 \text{ amu} = \frac{1}{12}^{\text{th}}$ of C-12 atom

Q2) Ans:- C

Solution:- He, $1 \text{ mole} = 4 \text{ grams}$

$$4 \text{ grams} = 6 \times 10^{23} \text{ 'He' atoms}$$

$$x = 1 \text{ 'He' atom}$$

$$6 \times 10^{23} \times 2 = 4$$

$$2 = \frac{4}{6 \times 10^{23}} = 0.666 \times 10^{-23} \\ = 6.66 \times 10^{-24} \text{ gms}$$

Q3) Ans:- B.

Solution:- Molecules are the smallest particles of matter that can exist independently.

Q4) Ans:- A

Solution:- 1 mole of calcium atom weight = 40 gms

Q5) Ans:- A

Solution:- 1 mole of any substance contain

Avogadro no. of atoms/molecule

$$1 \text{ gram atom weight} = 6.023 \times 10^{23} \text{ atoms}$$

Q6) Ans: D

Solution: For 1 mole NH_3 , $\text{N} = 14 \text{ gms}$.

1 mole $\rightarrow 14 \text{ gms}$,

0.5 mole $\rightarrow x$

$$x = 0.5 \times 14 = 7 \text{ grams}$$

Q7) Ans: B.

Solution: Atomic mass of $\text{Zn} = 65.5 \text{ gms}$.

Mass = Gram atoms $\times$ Atomic mass

$$= 0.9 \times 65.5$$

$$= 58.95 \text{ gms}$$

Q8) Ans: B.

Solution: Atomic mass of $\text{C} = 12 \text{ gms}$.

mass = Gram atoms $\times$ Atomic mass.

$$= 0.4 \times 12$$

$$= 4.8 \text{ gms}$$

Q9) Ans: D

Solution: Atomic mass of $\text{S} = 32 \text{ grams}$

$$\text{mass} = 32 \times 3 = 96 \text{ gms}$$

Q10) Ans: D.

Solution: 1 mole of $\text{CaCO}_3 = 40 + 12 + 48 = 100 \text{ gms}$

$$2.5 \text{ moles of } \text{CaCO}_3 = 2.5 \times 100 = 250 \text{ gms}$$

Q11) Ans:- B

Solution:- 1 mole $\text{CaCO}_3 = 100 \text{ gms.}$

1 mole $\rightarrow 100 \text{ gms.}$

$x \rightarrow 20 \text{ gms}$

$$100x = 20$$

$$x = \frac{20}{100} = \frac{1}{5} = 0.2 \text{ moles.}$$

JEE Main Level Questions

Q12) Ans:- C

Solution:- For H atom = 1N atoms.

For H_2 molecule = 2N atoms. $\rightarrow$ 1 molecule

H : H_2

$$1N : 1N = \underline{\underline{1:1}}$$

Q13) Ans:- C

Solution:- For 1 mole $\text{CaCO}_3 = 20 + 6 + 24$
 $= 50 \text{ protons}$

For 100 gms of $\text{CaCO}_3 = 50 \times 6 \times 10^{23} \text{ protons.}$

For 10 gms of $\text{CaCO}_3 \xrightarrow{?} x$

$$100x = 10 \times 50 \times 6 \times 10^{23}.$$

$$x = \frac{10 \times 50 \times 6 \times 10^{23}}{100} = 30 \times 10^{23} \\ = 3 \times 10^{24} \text{ protons}$$

Q14) Ans:- A.

Solution:- For 1 mole of $\text{C}_6\text{H}_{12}\text{O}_6 = (6 \times 12) + 12 + 6(16)$
 $= 180 \text{ gms.}$

1 mole $\rightarrow 180 \text{ gms}$

x moles $\rightarrow 5.4 \text{ gms}$

$$180x = 5.4$$

$$x = \frac{5.4}{180} = 0.03 \text{ moles.}$$

Q15) Ans:- C.

Solution:- Atomic weight of He = 4 gms.

mass = Gram atoms $\times$ Atomic weight

Given mass = 8 gms.

$$\text{Gram atoms} = \frac{8}{4} = 2$$

Q16) Ans:- D

Solution:- 16 grams of Oxygen is.

1) 1 gram atom of Oxygen.

2) 0.5 gram moles of oxygen molecule.

3). Equivalent weight = $\frac{16}{8} = 2$

So 16 grams means 2 gram equivalents.

Q77) Ans: C

Solution: 1 mole $\text{Na}_2\text{CO}_3 = 46 + 12 + 48 = 106 \text{ gms.}$

1 mole $\rightarrow 106 \text{ gms}$

$x \rightarrow 5.3 \text{ grams}$

$$106x = 5.3$$

$$x = \frac{5.3}{106} = 0.05 = 0.05 \text{ moles}$$

Q78) Ans: B

Solution:

1 mole $\text{NaOH} = 23 + 16 + 1 = 40 \text{ grams}$

1 mole $\rightarrow 40 \text{ grams}$

$x \rightarrow 60 \text{ grams}$

$$40x = 60$$

$$x = \frac{60}{40} = 1.5 \text{ moles.}$$

Q79) Ans: A

Solution: No. of moles = $\frac{\text{mass}}{\text{G.M.W.}}$

$$= \frac{256}{32} = 8 \text{ moles.}$$

1 mole of O_2 have 2 gram atoms

8 moles of O_2 have 16 gram atoms

Q80) Ans: D

Solution: $n = \frac{60}{12} = 5 \text{ moles}$

1 mole of C have 1 gram atom.

5 moles of C have 5 gram atoms

Q21) Ans:- A

Solution:- 1 mole of $\text{HCl} = 1 + 35.5 = 36.5 \text{ gms.}$

$$1 \text{ mole} \rightarrow 36.5 \text{ gms}$$

$$x \text{ moles} \rightarrow 7.3 \text{ gms}$$

$$36.5x = 7.3$$

$$x = \frac{7.3}{36.5} = 0.2 \text{ moles}$$

Advanced Level Questions

Q22) Ans:- A, B, C.

Solution:- At STP, any gas can occupy

$$22.4 \text{ litres} = 22400 \text{ mL} = 22.4 \text{ dm}^3 \\ = 22400 \text{ cm}^3$$

Q23) Ans:- A, C.

Solution:- 1 mole of C-12 contains 6.02×10^{23} atoms.

$$\text{Total no. of electrons} = 6 \times 6.022 \times 10^{23} \\ = 36 \times 10^{23} = 3.6 \times 10^{24} \text{ electrons}$$

Total no. of sub atomic particles.

$$e^- = 6, p = 6, n = 6, \text{ Total} = 18$$

$$\text{Total no. of sub atomic particles} = 18N.$$

Q24) Ans:- B

Solution:- Gram molecular weight = 1 mole = 6.023×10^{23} molecules.

Q25)

Ans - C

Solution:- $\frac{1}{12}$ th of mass of C-12 = 1.66×10^{-24} gm
 $= 1.66 \times 10^{-27}$ kg.

Atomic weight units amu

Q26)

Ans - D.Solution:- Atomic mass of Si = 28 amu.

$$100 \text{ 'Si' atomic mass} = 28 \times 100$$

$$= 2800 \text{ amu.}$$

$$1 \text{ amu} = 1.66 \times 10^{-24} \text{ gm}$$

$$100 \text{ 'Si' atomic mass} = 2800 \times 1.66 \times 10^{-24}$$

$$= 28 \times 1.66 \times 10^{-22} \text{ gm.}$$

Q27)

Ans - CSolution:- Atomic weight of Oxygen = 100. (Given)

$$\text{Molecular weight of water} = \text{H}_2\text{O}$$

$$= 2(1) + 16 = 18 \text{ gm}$$

$$\text{For } 16 \text{ gm Oxygen H}_2 \text{ weight} = 2 \text{ gm.}$$

$$\text{For } 100 \text{ gm Oxygen H}_2 \text{ weight} = x \text{ gm}$$

$$\begin{array}{ccc} 16 & \rightarrow & 2 \\ 100 & \rightarrow & x \end{array} \Rightarrow 16x = 200$$

$$x = \frac{200}{16} = 12.5$$

$$\text{Molecular weight of water} = 12.5 + 100$$

$$= 112.5 \text{ gm}$$

Integer Type

Q28) Ans:- 2240

Solution:- 1 mole $\text{CO}_2 = 44 \text{ gms.}$

$$44 \text{ gms} \rightarrow 22400 \text{ cc}$$

$$4.4 \text{ gms} \rightarrow x$$

$$44x = 22400 \times 4.4$$

$$x = \frac{22400 \times 4.4}{44}$$

$$= 2240 \text{ cc}$$

Q29) Ans:- 40.

Solution:- 1 mole of water = 18 gms.

$$1 \rightarrow 18 \text{ gms}$$

$$x \text{ moles} \rightarrow 720 \text{ grams}$$

$$18x = 720$$

$$x = \frac{720}{18} = 40$$

$$= 40 \text{ moles.}$$

Matrix Matching

Q30) Ans: A) 4 B) 3 C) 2 D) 1

Solution:-

A) 1.008 g of $\text{H}_2 \rightarrow 4) 3.0115 \times 10^{23}$ molecules

B) 245 of $\text{KClO}_3 \rightarrow 3) 2$ moles of $\text{KClO}_3 = 12.046 \times 10^{23}$ molecules.

C) 71 grams of $\text{CH}_4 \rightarrow 2) 22.4$ litres at STP.

D) 10.8 grams of Silver $\rightarrow 1) 0.1$ gram atoms.

4. STOICHIOMETRY

KEY

TEACHING TASK									
JEE MAINS LEVEL QUESTIONS									
1	2	3	4	5	6	7	8	9	10
B	A	A	A	D	C	B	A	B	D
JEE ADVANCED LEVEL QUESTIONS									
11	12	13	14	15	16	17	18	19	20
B	C	B	E	C	D	A	5	30	
20 a-3,b-1,c-4,d-2									
LEARNERS TASK									
CUQ'S&MAINS&ADVANCED									
1	2	3	4	5	6	7	8	9	10
A	C	B	A	A	D	B	B	D	D
11	12	13	14	15	16	17	18	19	20
B	C	C	A	C	D	C	B	A	D
21	22	23	24	25	26	27	28	29	30
A	A,B,C	A,C	B	C	D	C	2240	40	
30 A-4,B-3,C-2,D-1									