Introduction to Mole - Basics

Course on Mole Concept for Class XI

akhilesh • Lesson 1 • June 3, 2021

1. All topic will be covered.

2. 10th - 11th moving 13th (Droppers).

3. Sheets / DPP → update section

4. NCERT / No other Book

5. Planning → Teachers

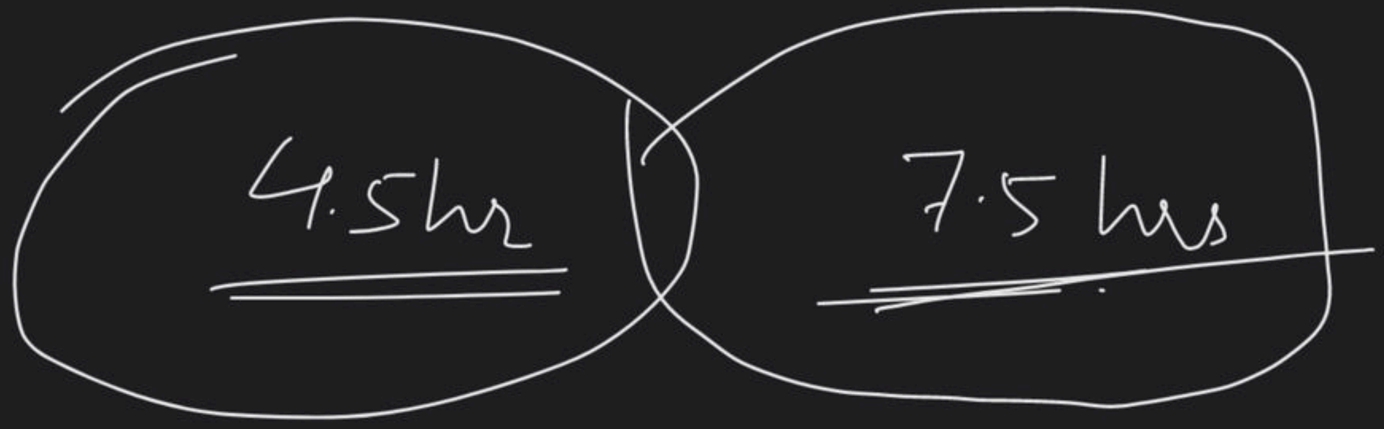
6. Regular classes

7. Regular H.W

8. 2 Register → Theory H.W

→ Notes

→ 1 lecture — 2.5 hr self study (notes Revision H.W)



1. Mole concept
2. Conc. terms
3. Ideal gas
4. Real Gas
5. Atomic str
6. Redox
7. Chemical eqlbm

Mole concept :→

$$\text{Atomic mass} = \frac{\text{Mass of an atom (gm)}}{\frac{1}{12}\text{th of mass of single atom of C-12 (gm)}}$$

$$27 = \text{Atomic mass} = \frac{\text{Mass of an atom (amu)}}{1 \text{ amu}}$$

$$27 \times 1 \text{ amu} = \text{mass of an atom}$$

mass of $\frac{1}{12}$th of single atom of C-12 $= 1.67 \times 10^{-24}$ gm

$= 1$ a.m.u.

$= 1$ u

(unified mass)

Atomic mass of Al = 27

mass of an atom of AL = 27 amu.

$= 27 \times 1.67 \times 10^{-24}$ gm

Atomic mass of Fe = 56

mass of an atom of Fe = 56 amu

$= 56 \times 1.67 \times 10^{-24}$ gm

Mass of 5 atoms of Al = 5×27 amu

$= 135$ amu

Molecular mass of H_2O = 18

$2 + 16$

$CaCO_3$

$40 + 12 + 48 = 100$

Mol. mass of H_2O = 18

mass of one molecule of H_2O = 18 amu

mass of 5 molecules of H_2SO_4

= 5 × 98 amu = 490 amu

gm atomic mass of Al = 27 gm

no. of Aluminium atoms in 27 gm = $\frac{27\ gm}{27\ amu}$

$= \frac{27\ gm}{27 \times 1.67 \times 10^{-24}\ gm}$

$= \frac{1}{1.67 \times 10^{-24}} = 6.022 \times 10^{23}$

No of atoms of elements in their gm atomic mass will be same.

$= 6.022 \times 10^{23}$

$=$ Avogadro's Number (N_A)

$=$ 1 mole

1 mol Al → 6.022×10^{23} atom = N_A

→ 27 gm

mass of 1 mol sub = gm atomic mass

(Molar mass)

5 mol $H_2O(\ell)$ → $5 \times 18\,gm = 90\,gm\ H_2O$

→ $5\,N_A$ molecule of H_2O

$5\,N_A$

mass of

100 mol Fe

$= 100\,N_A$

$= 100 \times 56\,gm$

$= 5600\,gm$

$= 5.6\,kg.$

100 gm Fe

100 gm Al

Atomic mass of Al = 27

Mass of an atom of Al = 27 amu

mass of 1 mol of Al = 27 gm

(Molar mass)

Mass of 5 molecule of H_2O = 90 amu

Mass of 5 mole of H_2O = 90 gm

$3N_A$ 3 mol

$4N_A$ 4 mol

27 gm 1 mol

54 gm 2 mol

81 gm 3 mol

$$\text{no. of moles} = \frac{\text{mass of substance (gm)}}{\text{molar mass (gm) or gm-atomic mass}}$$

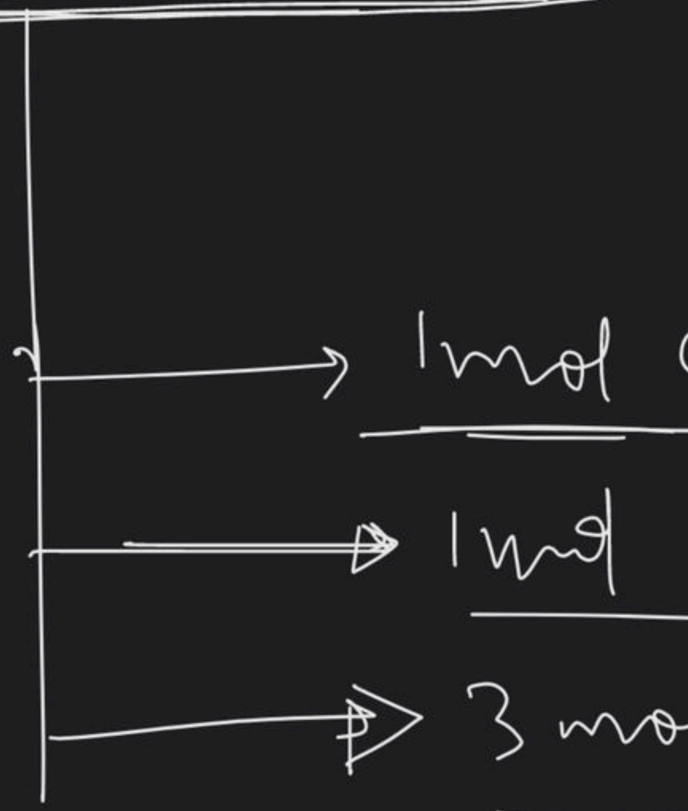
$$= \frac{\text{no of atoms/molecule}}{N_A}$$

54 gm

$2N_A$

1 mole $CaCO_3$ = 100 gm $CaCO_3$

= N_A molecule of $CaCO_3$



1 mol Ca = N_A atom of Ca ≡ 40 gm

1 mol C = 1 " 'C' ≡ 12 gm

3 mol 'O' = $3N_A$ atom of O ≡ 48 gm

2 mol C_2H_5Cl = $2 \times 65.5\ gm = 131\ gm$

= $2N_A$ molecule.

- 4 mol of C = $4N_A \equiv 48\ gm$
- 12 mol of H = $12N_A \equiv 12\ gm$
- 2 mol of Cl = $2N_A \equiv 71\ gm$

Molar mass of C_2H_5Cl = $24 + 6 + 35.5$

Atomic mass of Cl = 35.5

DPP # 01

1. Find the molar mass of the following molecules :

Given : Atomic mass : O = 16, N = 14, S = 32, C = 12, Cu = 63.5

(i) O_2 (ii) N_2 (iii) NO_2

(iv) H_2O (v) NH_3 (vi) N_2O_4

(vii) SO_2 (viii) H_2SO_4 (ix) CO_2

(x) Glucose ($C_6H_{12}O_6$) (xi) Acetic acid (CH_3COOH) (xii) Sucrose ($C_{12}H_{22}O_{11}$)

(xiii) Blue vitriol ($CuSO_4.5H_2O$)

2. Find the number of moles of the following :

(i) 28 g of N_2 (ii) 28 g of N (iii) 64 g of O_2

(iv) 64 g of O (v) 54 mg of H_2O (vi) 48 mg of CH_4

(vii) 23 mg of NO_2 (viii) 15 mg of CH_3COOH

3. Find the following for 180 gm of glucose :

Give : Glucose ($C_6H_{12}O_6$)

Atomic weight : C = 12 , H = 1 , O = 16

(i) Number of mole of glucose

(ii) Number of molecules of glucose

(iii) Number of moles of carbon atom

(iv) Number of moles of hydrogen atom

(v) Number of moles of oxygen atom

(vi) Number of atoms of carbon, hydrogen and oxygen

(vii) Total number of atoms

4. For 49 g of H_2SO_4, Find the following :

(i) Number of moles of H_2SO_4

(ii) Number of moles of hydrogen, sulphur and oxygen atom

(iii) Number of molecules of H_2SO_4

(iv) Number of atoms of hydrogen, sulphur and oxygen

(v) Total number of atoms

5. For 180 gm of Acetic acid (CH_3COOH), calculate the following :

(i) Number of moles of acetic acid

(ii) Number of molecules of acetic acid

(iii) Number of moles of carbon, oxygen and hydrogen atom

(iv) Number of atoms of carbon, oxygen, and hydrogen

(v) Total number of atoms

6. For the ideal gas, find the missing parameter in each part among P, V, T and n :

(i) P = 0.8314 Pa	V = 6000 m^3	T = 300 K
(ii) P = 5 atm	V = 8.21 L	T = 200 K
(iii) P = 831.4 Pa	V = 5000 L	T = 250 K
(iv) V = 8.21 L	T = 500 K	n = 10
(v) V = 100 m^3	T = 300 K	n = 3
(vi) P = 831.4 Pa	V = 1000 L	n = 0.1
(vii) P = 22.4 atm	T = 273 K	n = 2
(viii) V = 45.4 m^3	T = 2730 K	n = 5

7. Find the volume of ideal gas at STP :

(i) 2 moles of PCl_5 (ii) 0.25 moles of NH_3

(iii) 0.5 moles of NO_2 (iv) 4 moles of N_2

8. Find the moles of ideal gas at STP :

(i) 22.7 L of O_2 (ii) 45.4 L of N_2

(iii) 45.4 mL of NO_2 (iv) 11.35 mL of NH_3

(v) 2.27 dm^3 of SO_3 (vi) 113.5 m^3 of CO_2

1 mole 'N' = N_A no. of 'N' atoms

1 mol N_2 = N_A no of N_2 molecule

= $2N_A$ atoms of 'N'

1 mol 'O' = N_A atom of O

1 mol O_2 = $2N_A$ " "

1 mol O_3 = $3N_A$ " "

1 mol Nitrogen = 1 mol N_2

1 mol Oxygen = 1 mol O_2

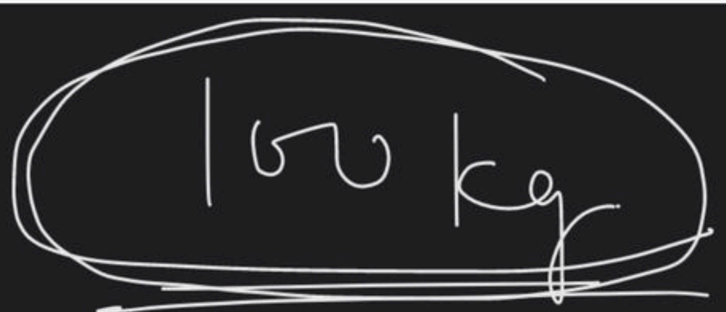
1 molecule $CaCO_3$

1 molecule (1 atom) + (1 atom) + (3 atom)

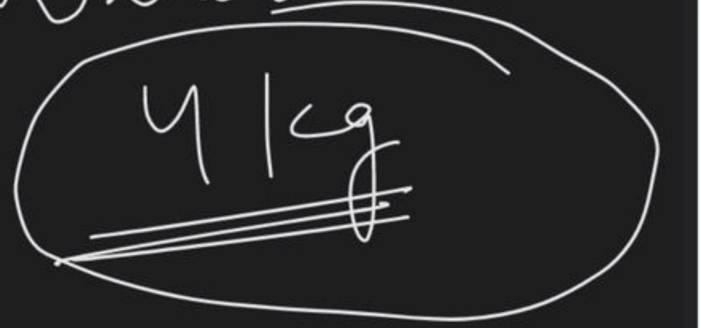
N_A molecule N_A N_A $3N_A$

3 mol 'O'

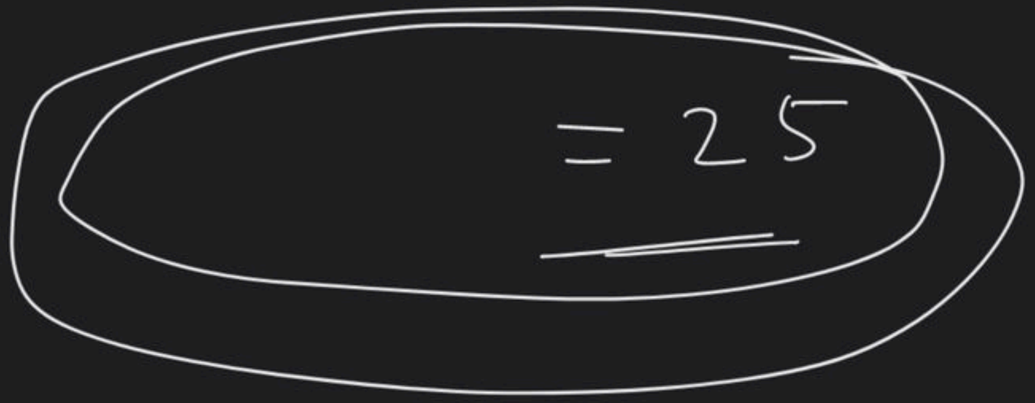
1 mol 1 mol 1 mol



Watermelon



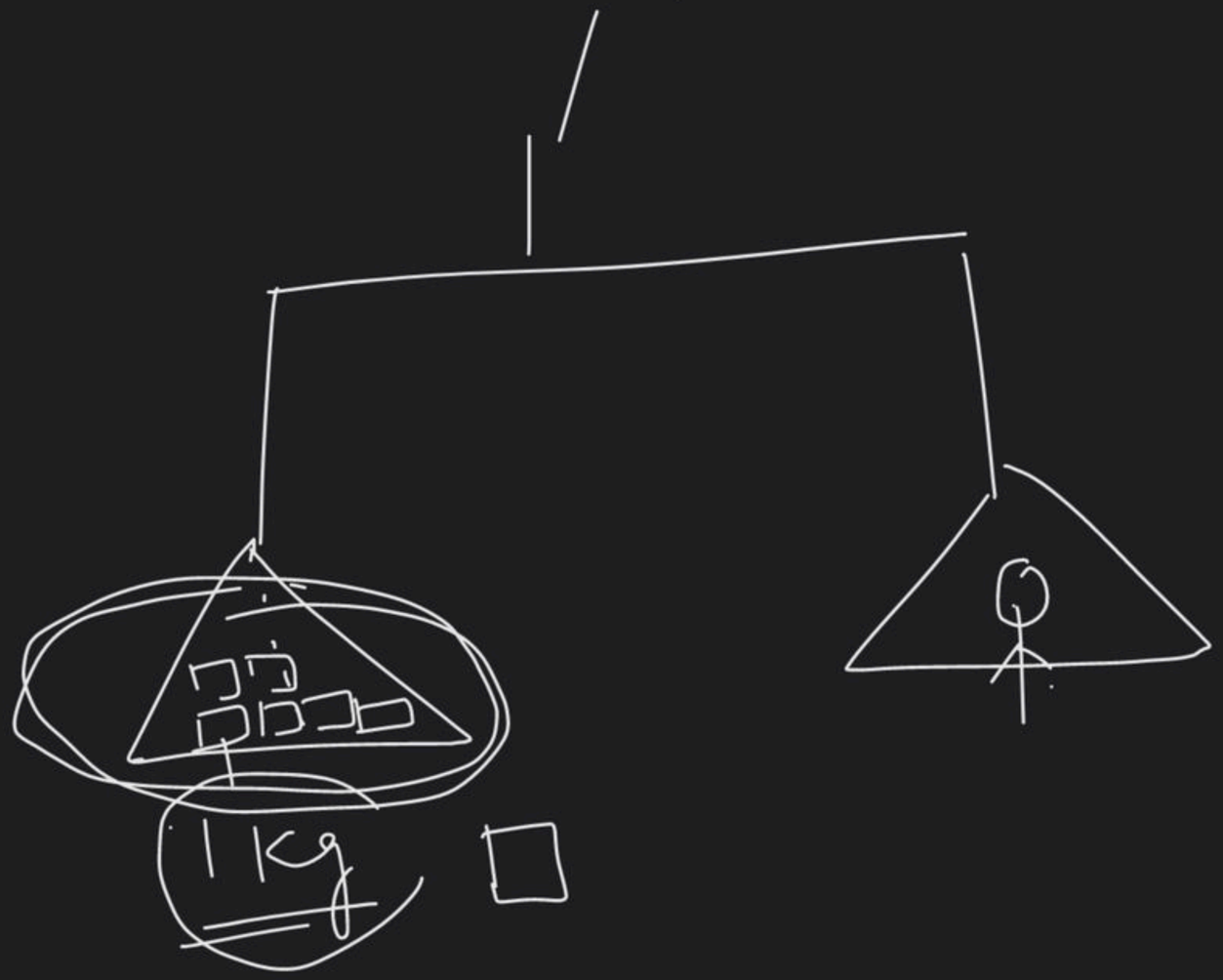
4 kg



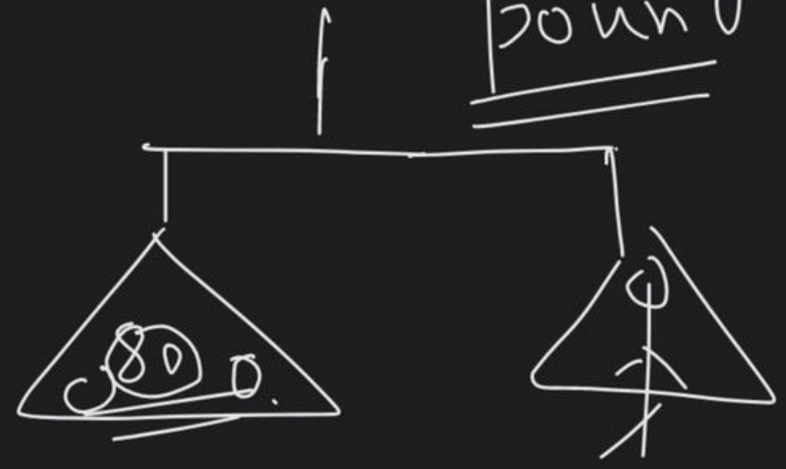
50 kg

50000 gm

80 pounds



1 pound



weight = mg

mass

Akk

IIT-BHU - 2002.