

## MOLE CONCEPT

- Q.1** Which of the following has the largest number of atoms ?
- (A) 0.5 g atoms of Cu                      (B) 0.635 g of Cu atoms  
(C) 0.25 moles of Cu atoms              (D) 1g of Cu
- Q.2** 27 g of Al (at. mass 27) will react completely with oxygen equal to-
- (A) 24 g                      (B) 8 g                      (C) 40 g                      (D) 10 g
- Q.3** 2.76 g of silver carbonate (at. mass of Ag = 108) on being heated strongly yields a residue weighing-
- (A) 2.16 g                      (B) 2.48 g                      (C) 2.32 g                      (D) 2.64 g
- Q.4** 'M' is the molecular mass of ' $\text{KMnO}_4$ '. The equivalent mass of  $\text{KMnO}_4$  when it is converted into  $\text{K}_2\text{MnO}_4$  is-
- (A) M                      (B) M/3                      (C) M/5                      (D) M/7
- Q.5** If 0.5 mol of  $\text{BaCl}_2$  is mixed with 0.2 mol of  $\text{Na}_3\text{PO}_4$ , then maximum number of moles of  $\text{Ba}_3(\text{PO}_4)_2$  that can be formed is-
- (A) 0.7                      (B) 0.5                      (C) 0.3                      (D) 0.1
- Q.6** The number of gram-molecule of oxygen which contain  $6.02 \times 10^{24}$  CO molecules is-
- (A) 10g molecule                      (B) 5g molecule  
(C) 1g molecule                      (D) 0.5g molecule
- Q.7** Rearrange the following (I to IV) in the order of increasing masses and choose the correct answer from (A), (B), (C) and (D).  
(At. mass : N = 14, O = 16, Cu = 63)
- (I) 1 molecule of O  
(II) 1 atom of nitrogen  
(III)  $1 \times 10^{-10}$  g molecular mass of oxygen  
(IV)  $1 \times 10^{-7}$  g atomic mass of copper.
- (A) II < I < III < IV                      (B) IV < III < II < I  
(C) II < III < I < IV                      (D) III < IV < I < II

**Q.8** Assume that the nucleus of the fluorine atom is a sphere of radius  $5 \times 10^{-13}$  cm. What is the density of matter in the molecules ?

- (A)  $6.02 \times 10^{23}$  g/mL                      (B)  $6.02 \times 10^{13}$  g/mL  
(C)  $12.02 \times 10^{23}$  g/mL                      (D)  $12.02 \times 10^{13}$  g/mL

**Q.9** The simplest formula of a compound containing 50% of element of X (atomic mass = 10) and 50% of element Y (atomic mass 20) is-

- (A) XY                      (B)  $X_2Y$                       (C)  $XY_3$                       (D)  $X_2Y_3$

**Q.10** An aqueous solution of 6.3 g of oxalic acid dihydrate is made upto 250 mL. The volume of 0.1 N NaOH required to completely neutralise 10 mL of this solution is-

- (A) 40 mL                      (B) 20 mL                      (C) 10 mL                      (D) 4 mL

### ANSWER KEY

<b>Q.No.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Ans.</b>	A	A	A	A	D	B	A	B	B	A

## SOLUTIONS (MOLE CONCEPT)

**Ans.1**  $0.5 \text{ g-atom Cu} = 0.5 \times 6.02 \times 10^{23}$   
 $= 3.01 \times 10^{23} \text{ Cu atom}$

$$0.635 \text{ g Cu} = \frac{0.635}{63.5} \times 6.02 \times 10^{23}$$

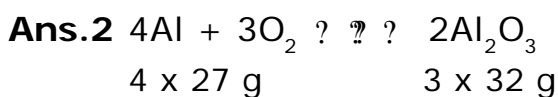
$$= 6.02 \times 10^{21} \text{ Cu atom}$$

$$0.25 \text{ moles Cu} = 0.25 \times 6.02 \times 10^{23}$$

$$= 1.5 \times 10^{23} \text{ Cu atom}$$

$$1 \text{ g Cu} = \frac{1}{63.5} \times 6.02 \times 10^{23}$$

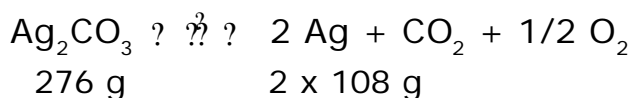
$$= 9.48 \times 10^{21} \text{ Cu atom}$$



27 g of Al will react with oxygen

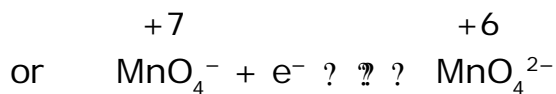
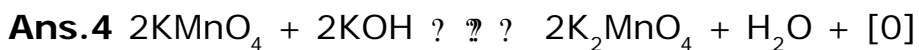
$$= \frac{3}{4} \times 32 = 24 \text{ g}$$

**Ans.3**  $\text{Ag}_2\text{CO}_3$  on strong heating gives Ag.

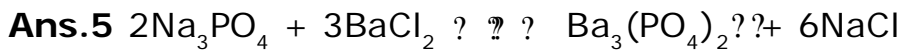


276 g of  $\text{Ag}_2\text{CO}_3$  on strong heating gives = 216 g of Ag

2.76 g of  $\text{Ag}_2\text{CO}_3$  on strong heating gives = 2.16 g of Ag



$$\text{Eq. mass} = \frac{\text{Mol. mass}}{\text{Change in O.N.}} = \frac{M}{1} = M$$



3 mol  $\text{BaCl}_2$  → 2 mol of  $\text{Na}_3\text{PO}_4$

0.5 mol  $\text{BaCl}_2$  →  $\frac{2}{3} \times 0.5$  mol of  $\text{Na}_3\text{PO}_4$

→ 0.33 mol of  $\text{Na}_3\text{PO}_4$

But mole of  $\text{Na}_3\text{PO}_4 = 0.2$

∴  $\text{Na}_3\text{PO}_4$  is the limiting reactant.

2 mole of  $\text{Na}_3\text{PO}_4$  gives 1 mole of  $\text{Ba}_3(\text{PO}_4)_2$

0.2 mole of  $\text{Na}_3\text{PO}_4$  gives 0.1 mole of  $\text{Ba}_3(\text{PO}_4)_2$ .

∴ Max.  $\text{Ba}_3(\text{PO}_4)_2$  formed = 0.1 mol

**Ans.6** Number of oxygen atoms = Number of CO molecules

$$= 6.022 \times 10^{24}$$

Number of oxygen molecule =  $\frac{1}{2} \times$  Number of oxygen atoms

$$= \frac{1}{2} \times 6.022 \times 10^{24}$$

$$= 3.011 \times 10^{24}$$

$$\text{Number of g-molecule of } \text{O}_2 \text{ molecules} = \frac{3.011 \times 10^{24}}{6.022 \times 10^{23}}$$

$$= 5 \text{ g-molecule}$$

**Ans.7** (I) Mass of one O atom =  $\frac{16 \text{ g}}{6.02 \times 10^{23}}$

$$= 2.66 \times 10^{-23} \text{ g}$$

(II) Mass of one N atom =  $\frac{14 \text{ g}}{6.02 \times 10^{23}}$

$$= 2.33 \times 10^{-23} \text{ g}$$

(III) 1g-molecule of oxygen = 32 g

$$1 \times 10^{-10} \text{ g molecule of oxygen} = 32 \times 10^{-10}$$

$$= 3.2 \times 10^{-9} \text{ g}$$

(IV) 1g-atom of copper = 63 g

$$1 \times 10^{-7} \text{ g-atom of copper} = 63 \times 10^{-7}$$

$$= 6.3 \times 10^{-6} \text{ g}$$

Arranging in the increasing order of masses

$$\text{II} < \text{I} < \text{III} < \text{IV}$$

**Ans.8** Since almost whole the mass of an atom is in the nucleus,

Mass of F nucleus = Mass of F atom

$$= \frac{19}{6.02 \times 10^{23}} \text{ g}$$

$$= 3.15 \times 10^{-23} \text{ g}$$

(At. mass of F = 19)

$$\text{Volume of nucleus} = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times (5 \times 10^{-13})^3 \text{ cm}^3$$

$$= 5.24 \times 10^{-37} \text{ cm}^3$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{3.15 \times 10^{-23} \text{ g}}{5.24 \times 10^{-37} \text{ cm}^3}$$

$$= 6.02 \times 10^{13} \text{ g cm}^{-3}$$

$$= 6.02 \times 10^{13} \text{ g/ml.}$$

**Ans.9**

Element	%	At. mass	% At. mass	Atomic ratio
X	50%	10	$\frac{50}{10} = 5$	2
y	50%	20	$\frac{50}{20} = 2.5$	1

**Ans.10** Eq. mass of  $\begin{array}{c} \text{COOH} \\ | \\ \text{COOH} \end{array} \cdot 2\text{H}_2\text{O} = \frac{\text{Mol. mass}}{\text{Basicity}} = \frac{126}{2} = 63$

$$\text{? Normality of oxalic acid solution} = \frac{6.3 \times 1000}{63 \times 250} = 0.4 \text{ N}$$

$$N_1 V_1 = N_2 V_2$$

NaOH Oxalic acid

$$0.1 \times V_1 = 0.4 \times 10 \text{ ml}$$

$$V_1 = 40 \text{ mL}$$