

## FOUNDATION BUILDER (OBJECTIVE)

1. (D)
2. (D)
3. (B)
4. (A)  
Most stable isotope of carbon
5. (D)
6. (C)  
Equal volumes of gases have equal number of molecules (not atoms) at same temperature and pressure condition.
7. (A)  
Moles of gas =  $\frac{5.6}{22.4} = 0.25$   
Molecular weight of gas =  $\frac{7.5}{0.25} = 30$   
Hence NO.
8. (A)  
Molecular weight of  $C_{60}H_{122} = 60 \times 12 + 122 = 842$ .  
Weight of a molecule =  $\frac{842}{6.022 \times 10^{23}} = 1.39 \times 10^{-21} \text{ g}$ .
9. (A)  
1 mole contains Avogadro number  $CO_2$  molecules & each molecule of  $CO_2$  has one C atom  
So number of C atoms =  $N_A$ .
10. (A)  
Moles of  $N_2 = \frac{1.4}{28} = 0.05$ .  
Number of atoms =  $0.05 \times 2 \times 6.02 \times 10^{23}$ .  
 $= 6.02 \times 10^{22}$ .
11. (D)  
(A)  $\frac{22.4 \times 10^3}{22400} \times N_A = 6.022 \times 10^{23}$   
(B)  $\frac{22}{44} \times 6.022 \times 10^{23} = 3.011 \times 10^{23}$   
(C)  $\frac{11.2}{22.4} \times 6.022 \times 10^{23} = 3.011 \times 10^{23}$   
(D)  $0.1 \times 6.022 \times 10^{23} = 6.022 \times 10^{22}$
12. (C)  
Number of gms of  $H_2SO_4 = 0.25 \times 98 = 24.5$

13. (D)

$$\text{Moles of H}_2 = \frac{1}{2} = 0.5$$

$$\text{Volume of H}_2 \text{ in } l = 0.5 \times 22.4 = 11.2l.$$

14. (D)

$$\text{Moles of Au} = \frac{19.7 \times 1000}{197} = 100$$

$$\text{Atoms of Au} = 100 \times 6.022 \times 10^{23} = 6.022 \times 10^{25}.$$

15. (A)

$$\text{Mass of one molecule of CO}_2 = \frac{44}{6.02 \times 10^{23}} = 7.31 \times 10^{-23}$$

16. (C)

$$\text{Number of moles of H}_2 = \frac{0.224}{22.4} = 0.01$$

17. (B)

18. (B)

$$W_H = 3 \times 3 = 9g \quad W_N = 3 \times 14 = 42g$$

19. (C)

In one H<sub>2</sub>O molecule: 10 proton, 8 neutrons, 10 electrons

$$\text{Hence in 36 ml, } n_{\text{H}_2\text{O}} = \frac{36g}{18g/\text{mol}} = 2\text{mols}$$

$$\therefore \text{Protons} = 2N_A \times 10 = 20N_A$$

20.  $n_{\text{atoms}} = \frac{W}{\text{at.wt}}$ . Hence it should be of same weight 'W'

[A]

$$21. \text{no. of moles} = \frac{10^{-3}N_A}{N_A} = 10^{-3}$$

$$\therefore \text{wt} = 10^{-3} \times \text{mol.wt} = 10^{-3}M_0g = M_0\text{mg}$$

[B]

$$22. \text{A: } 12g; \text{ B: } \frac{1}{2} \times 16 = 8g; \text{ C: } 10g; \text{ D: } \frac{16}{2} = 8g$$

$\therefore$  [A]

$$23. \text{A: } 2.5 \times 5N_A = 12.5N_A; \text{ B: } 10N_A; \text{ C: } 4 \times 3N_A = 12N_A; \text{ D: } 1.8 \times 8N_A = 14.4N_A.$$

Hence [D]

$$24. \quad \frac{52 \text{ amu}}{4 \text{ amu}} = 13$$

[C]

$$25. \quad \text{One ion contains: } 7 + 24 + 1 = 32 \bar{e}$$

$$\therefore \text{ total } \bar{e}\text{s} = 2 N_A \times 32 = 64 N_A$$

[B]

$$26. \quad n_C = 0.5 \times 6 = 3 \quad \therefore \text{ wt} = 36 \text{ g}$$

[D]

$$27. \quad A: \frac{28}{44}; B: \frac{46}{46}; C: \frac{36}{18}; D: \frac{54}{108}$$

$\therefore$  [C]

$$28. \quad n_{\text{H}_2\text{O}} = \frac{180}{18} = 10$$

$$\therefore \text{ no. of } \bar{e}\text{s} = 10 \times 10 N_A = 100 N_A$$

[D]

$$29. \quad n_{\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}} = \frac{2.48}{248} = 0.01$$

$$\therefore n_{\text{H}_2\text{O}} = 5 \times 0.01 \Rightarrow \text{molecules} = 0.05 N_A$$

[c]

$$30. \quad n_{\text{Ag}} = \frac{90}{100} \times \frac{10}{108} = \frac{1}{12} \Rightarrow \text{atom} = \frac{1}{12} N_A = 5 \times 10^{22}$$

[c]

$$31. \quad n_{\text{H}_2\text{O}} = \frac{18 \times 333}{54 + (96 \times 3) + (18 \times 18)} = 9. \text{ Hence [B]}$$

$$32. \quad n_{\text{H}_2\text{O}} = \frac{0.018}{18} = 10^{-3}. \text{ Hence, molecules} = 10^{-3} N_A$$

$\therefore$  [C]

$$33. \quad n_{\text{N}^{3-}} = \frac{4.2}{14} = 0.3. \quad \therefore \text{total} = 0.3 \times 8 N_A = 2.4 N_A$$

$\therefore$  [A]

$$34. \quad n_C = 12 \times n_{\text{C}_{12}\text{H}_{22}\text{O}_{11}} = 12 \times \frac{3.42}{342} = 0.12$$

$$\therefore \text{atom} = 0.12 N_A \Rightarrow [\text{D}]$$

$$35. \quad n_{\text{MgCO}_3} = \frac{8.4}{84} = 0.1$$

Each contain  $(12 + 6 + 24)$  protons

$$\text{Hence, total} = 0.1 \times 42 N_A = 2.5 \times 10^{24}$$

[B]

$$36. \quad n_{\text{total}} = \frac{4.4}{44} + \frac{2.24}{22.4} = 0.2 \quad \therefore \text{molecules} = 0.2 N_A$$

[B]

37. [D]

$$38. \quad n_{\text{gas}} = \frac{w}{\text{mol.wt.}} = \frac{w}{3a}$$

[B]

$$39. \quad n_{\text{Fe}} = \frac{558.5}{55.85} = 10 \text{ moles}$$

In 60 g carbon,  $n_{\text{C}} = 5 \quad \therefore \text{twice} = 10 \text{ moles}$

[A]

40. Say  $n_{\text{Mg}_3(\text{PO}_4)_2} = n$ ; then  $n_{\text{O}} = 8n$

$$\therefore 8n = 0.25 \Rightarrow n = \frac{0.25}{8} = 3.125 \times 10^{-2}$$

[B]

$$41. \quad n_x : n_y = \frac{\left(\frac{w}{2}\right)}{10} : \frac{\left(\frac{w}{2}\right)}{20} = 2 : 1$$

Hence [B]

$$42. \quad \frac{X}{100} \times (46 + 96 + 180) = 180 \Rightarrow X = 55.9$$

[C]

$$43. \quad n_{\text{I}} : n_{\text{O}} = \frac{25.4}{127} : \frac{8}{16} = \frac{1}{5} : \frac{1}{2} = 2 : 5$$

Hence  $\text{I}_2\text{O}_5$ . [C]

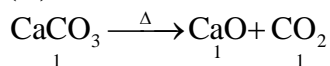
$$44. \quad \text{mol. Wt} = 2 \text{ VD} = 100$$

$$w_{\text{chlorine}} = \frac{71}{100} \times 100 = 71 \text{ g}$$

$$w_{\text{metal}} = 29 \text{ g}$$

[A]

45. (D)

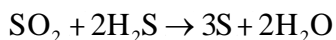


Quantity of limes tones = wt. of one mole mole of  $\text{CaCO}_3$   
= 100 kg

46. (A)

Moles of  $\text{H}_2\text{S} = 2$

$$\text{Moles of } \text{SO}_2 = \frac{11.2}{22.4} = 0.5$$



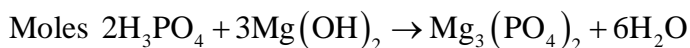
moles 1 2 3 2

given 0.5 2  $x = \frac{3 \times 0.5}{1} = 1.5$

(L.R.)

47. (C)

$$\text{Moles of } \text{Mg}(\text{OH})_2 = \frac{100}{58} = 1.724$$



Moles 2 3 1 6

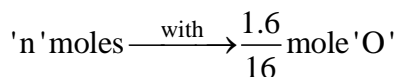
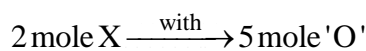
Given  $\frac{2 \times 1.724}{3}$

$$\text{Weight of } \text{H}_3\text{PO}_4 = \frac{2 \times 1.724}{3} \times 98 = 112.6\text{g}$$

48.  $n_{\text{H}_2\text{O}} = n_{\text{CH}_3\text{OH}} \times 2 = 4 \quad \therefore \text{wt} = 4 \times 18 = 72\text{g}$

[D]

49.  $W_{\text{O}} = 3.6769 - 2.0769 = 1.6\text{g}$



$$n = \frac{0.2}{5} = 0.04$$

[A]



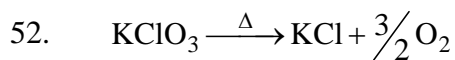
$$\therefore W_{\text{Ag}} = \frac{2.7}{(216 + 60)} \times 2 \times 108 = 2.11\text{g}$$

[A]

51.  $n_{\text{CO}_2} = 2 \times n_{\text{C}_2\text{H}_5\text{OH}} = 2$

$$\therefore W_{\text{CO}_2} = 2 \times 44 = 88\text{g}$$

Hence [D]



$$\text{Hence \% loss in wt} = \frac{48\text{g}}{122.5} \times 100 = 39.18$$

[C]

53.  $n_{\text{Fe}} = \frac{2}{3} \times n_{\text{H}_2\text{O}} = \frac{2}{3} \quad \therefore W_{\text{iron}} = \frac{2}{3} \times 56 = 37.39$

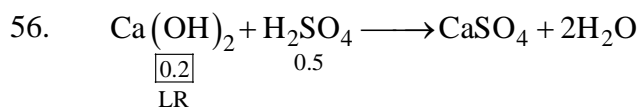
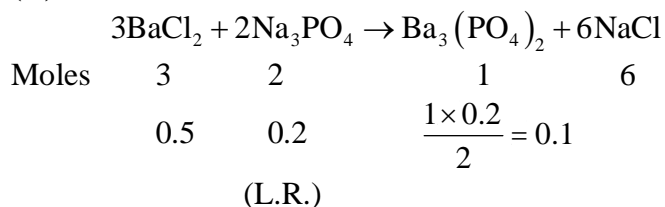
[A]

54.  $n_{\text{CaCO}_3} = n_{\text{CaO}} = \frac{1.62}{56} = n_{\text{CaCl}_2} = 0.0289$

$$\% \text{ of CaCl}_2 = \frac{0.0289 \times 111}{10} \times 100 = 32.11\%$$

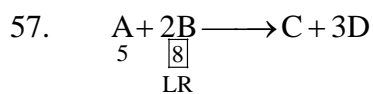
[B]

55. (D)



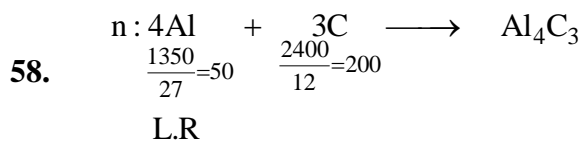
$$n_{\text{CaSO}_4} = n_{\text{Ca}(\text{OH})_2} = 0.2$$

[A]



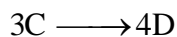
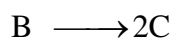
$$n_{\text{C}} = \frac{n_{\text{B}}}{2} = 4; \quad n_{\text{D}} = 3 \times \frac{n_{\text{B}}}{2} = 12$$

Hence [B]



$$\left. \begin{array}{l} 4\text{Al} \xrightarrow{\text{given}} 144 \\ 50 \xrightarrow{\text{given}} \text{W} \end{array} \right\} \Rightarrow w = 1800\text{g}$$

[D]



$$\therefore n_D = n_A \times \frac{2}{2} \times \frac{2}{1} \times \frac{4}{3}$$

$$= \frac{32}{3}$$

[D]

60. Mol.wt. =  $0.8 \times 28 + 0.2 \times 32 = 28.8$

$$\therefore VD = \frac{M}{2} = 14.4$$

[C]

61.  $D_{\text{Cl}_2 \text{ wrt air}} = \frac{D_{\text{Cl}_2}}{D_{\text{air}}} = \frac{M_{\text{Cl}_2}}{M_{\text{air}}} \approx \frac{71}{29}$

Hence [A]

62. Say  $\text{NO}_x$ . Then  $\frac{30.4}{100}(14 + 16x) = 14 \Rightarrow x = 2$

$$\therefore D_{\text{oxide wrt O}_2} = \frac{M_{\text{oxide}}}{M_{\text{O}_2}} = \frac{46}{32} = 1.44$$

[B]

63. molality =  $\frac{n}{w_{\text{solvent}}} \times 1000 \left( \text{urea : } \begin{array}{c} \text{NH}_2 \text{ C NH}_2 \\ \parallel \\ \text{O} \end{array} \right)$

$$= \frac{18/60}{(1500 \times 1.052 - 18)} \times 1000 = 0.192$$

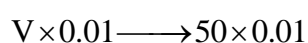
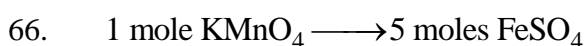
[B]

64. Molarity =  $\frac{n}{V(\text{mL})} \times 1000 = \frac{1/98}{1000} \times 1000 \approx 0.01$

[D]

65.  $[\text{Al}^{3+}] = \frac{20 \times 0.2 \times 2}{40} = 0.2\text{M}$

[A]



$$\Rightarrow V = 10\text{mL}$$

[D]

$$67. \quad n_{\text{H}^+} = \left(\frac{100}{1000}\right) \times 0.001 \times 2 = 2 \times 10^{-4}$$

$$\therefore \text{no. of H}^+ = 2 \times 10^{-4} N_A = 1.2 \times 10^{20}$$

[B]

$$68. \quad 3 \text{ molal} \Rightarrow 3 \text{ mole NaOH in } 1000\text{g solvent}$$

$$\therefore \text{vol} = \frac{\omega}{d} = \left(\frac{120 + 1000}{1.11}\right) = 1009\text{mL}$$

$$\therefore \text{Molarity} = \frac{n}{V(\text{mL})} \times 1000 = \frac{3}{1.009} = 2.97$$

[A]

69. (B)

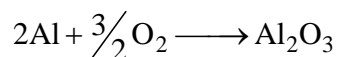
$$\text{Molarity of } \text{NO}_2\text{CO}_3 = \frac{2.65 \times 1000}{106 \times 250} = 0.1 \text{ M.}$$

$$\text{After dilution of } 10 \text{ mL solution} = \frac{0.1 \times 10}{1000} = 0.001 \text{ M}$$

$$70. \quad X_{\text{NaCl}} = \frac{n_{\text{NaCl}}}{n_{\text{NaCl}} + n_{\text{H}_2\text{O}}} = \frac{1}{1 + \frac{1000}{18}} = 0.0177$$

[A]

## GET EQUIPPED FOR JEE MAINS



$$n_{\text{Al}_2\text{O}_3} = \frac{n_{\text{O}_2}}{\frac{3}{2}} = 1$$

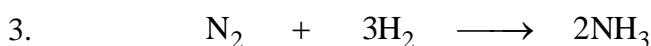
[A]

2. Consider 1 L solution

$$\frac{29}{100} \times (d \times 1000) = \omega_{\text{H}_2\text{SO}_4} = 3.6 \times 98$$

$$\therefore d = 1.22 \text{ g/mL}$$

[A]



$$n: \quad 10 \quad \quad \boxed{15} \quad \quad -$$

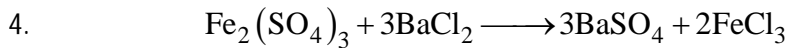
LR



$$10 - 5 \quad - \quad 10 \text{ moles}$$

$$n_{\text{N}_2} = 5 \quad n_{\text{H}_2} = 0$$

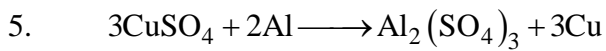
[A]



$$n: \quad \quad \quad ? \quad \quad \quad \frac{1}{2}$$

$$\frac{n_{\text{BaCl}_2}}{3} = \frac{n_{\text{FeCl}_3}}{2} \Rightarrow n_{\text{BaCl}_2} = \frac{1/2}{2} \times 3 = 0.75 \text{ moles}$$

[C]

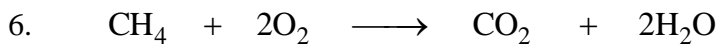


$$54 \text{ g Al} \xrightarrow{\text{displaces}} 192 \text{ g Cu}$$

$$27 \text{ g Al} \xrightarrow{\text{displaces}} \omega$$

$$\therefore \omega = 96 \text{ g}$$

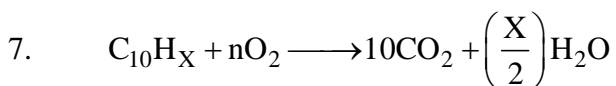
[C]



$$\begin{array}{ccccccc} 5 & & \boxed{8} & & - & & - \\ 5 - 4 = 1 & - & & & 4 & & 8 \end{array}$$

$$\therefore n_{\text{CO}_2} = 4; n_{\text{CH}_4}(\text{remaining}) = 1$$

[A]



$$\text{Hence, } n = 10 + \frac{x}{4}$$

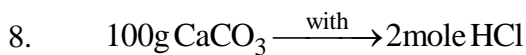
$$1 \text{ mole } \text{C}_{10}\text{H}_x \xrightarrow{\text{with}} \left(10 + \frac{x}{4}\right) \text{ moles}$$

$$2.5 \text{ moles} \xrightarrow{\text{with}} 32.5 \text{ moles}$$

$$\text{i.e. } 10 + \frac{x}{4} = \frac{32.5 \times 1}{2.5} = 13$$

$$\therefore x = (13 - 10) \times 4 = 12$$

[C]



$$\omega \text{ g} \xrightarrow{\text{with}} \left(\frac{25 \text{ L}}{1000}\right) \times 0.75 \text{ M HCl}$$

$$\therefore \omega = 0.9375 \text{ g}$$

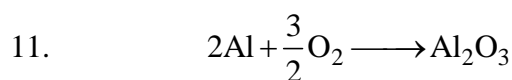
[D]

$$9. \quad n_{\text{AgCl}} = n_{\text{Cl}^-} = n_{\text{HCl}} = \frac{2.125}{143.5} = V(\text{L}) \times \text{Molarity}$$
$$\therefore \text{Molarity} = \frac{2.125 \times 1000}{143.5 \times 25} = 0.59$$

[B]

$$10. \quad 2X \xrightarrow{\text{with}} 3 \times 16 \text{ g Oxygen}$$
$$1 \text{ g} \xrightarrow{\text{with}} 0.16 \text{ g Oxygen}$$
$$\therefore X = \frac{3 \times 16}{0.16 \times 2} = 150$$

[D]



$$n: \quad n \quad \frac{1}{2}$$

$$2 \times 27 \text{ g Al} \xrightarrow{\text{with}} \frac{3}{2} \text{ mole O}_2$$

$$\omega \xrightarrow{\text{with}} \frac{1}{2} \text{ mole}$$

$$\omega = \frac{2 \times 27}{3} = 18 \text{ g}$$

[D]

$$12. \quad n_{\text{BaSO}_4} = n_{\text{SO}_2} = n_{\text{S}} \text{ (POAC on S)}$$
$$= \frac{8}{32} = \frac{1}{4} \quad \therefore \text{[D]}$$

$$13. \quad n_{\text{NaBr}} = n_1, \quad n_{\text{KBr}} = n_2 \text{ (say)}$$
$$n_{\text{AgBr}} = n_{\text{Br}} = n_1 + n_2 = \frac{0.97}{(108 + 80)} = 0.00516$$

$$\text{Also, } n_1 \times (103) + n_2 \times (119) = 0.560$$

$$\therefore n_2 = \frac{0.56 - 103 \times 0.00516}{16} = 0.00178$$

$$\therefore W_{\text{KBr}} = 119n_2 = 0.212 \text{ g}$$

[B]

$$14. \quad \text{A: } n_{\text{H}} = 4 \times \frac{16 \text{ g}}{16 \text{ g}} = 4; \quad \text{B: } n_{\text{H}} = 4 \times \frac{31.2}{76} = 1.64$$
$$\text{C: } n_{\text{H}} = 22 \times \frac{34.2}{342} = 2.2; \quad \text{D: } n_{\text{H}} = 12 \times \frac{36}{180} = 2.4$$

Hence [A]

$$15. \quad \text{Total atoms} = 200 + 0.05 \times N_{\text{A}} + 10^{-20} \times N_{\text{A}}$$

$$\approx 0.05 N_A = 3 \times 10^{22}$$

[C]

16. Mol. Wt of  $A_2B_3 = 150 + 96 = 246$

$\therefore$  For 5 mol,  $(246 \times 5)g = 1.23 \text{ kg}$

[C]

17. A:  $10N_A$ ; B:  $11 \times \frac{200}{342} = 6.43N_A$ ; C:  $\frac{144}{48}N_A \times 3 = 9N_A$

D:  $2.5 \times 3N_A = 7.5N_A$ .

Hence [A]

18. [D] obvious

19. A:  $\frac{1}{44} \times 3N_A$ ; B:  $\frac{1}{114} \times 26N_A$ ; C:  $\frac{1}{30} \times 8N_A$ ; D:  $\frac{1}{26} \times 2N_A$

Hence [A]

20.  $\frac{9.2}{46} \times 2 = n \times 1 \Rightarrow n = 0.4 \quad \therefore \text{wt} = 0.4 \times 30 = 12g$

[C]

21.  $n_{CO_2} = n$ , say. Then  $n_O = 2n = \frac{8}{16} \Rightarrow n = \frac{1}{4}$

$\therefore$  [D]

22. A:  $0.2 \times 14g = 2.8g$ ; B:  $\frac{3 \times 10^{23}}{6 \times 10^{23}} \times 12g = 6g$ ; C: 32 g; D: 7 g.

Hence [A]

23. [D] 1 gram molecule: 44 g  
1 molecule of  $CO_2 = 44 \text{ amu}$

24.  $n_H = n \times 2 + 2n \times 4 = 10n$

$n_C = 2n \times 1 = 2n$

$\therefore n_C : n_H = 1 : 5$

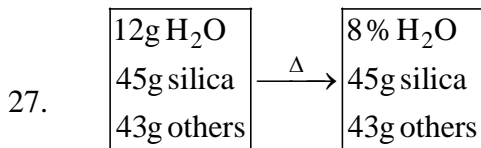
[A]

25. Total charge =  $1 \times N_A \times 3e = 3N_Ae$  coulomb

Hence [D]

26.  $\frac{69.98}{100} \times \text{Mol.wt} = 21 \times 12 \Rightarrow \text{mol.wt} = 360$

[D]



100g original 'w' grams

8 % of w = water

i.e. 92 % of w = silica others

Hence,  $\frac{92}{100} \times w = 88g \Rightarrow w = 95.65$

$\therefore$  % of silica =  $\frac{45}{95.65} \times 100 = 47\%$

[D]



$\therefore \frac{28}{100} \times (3M + 28) = 28 \Rightarrow M = 24$

[C]

29. 0.014%  $\times$  mol.wt = 2  $\times$  at. wt of N

i.e.  $\frac{0.014}{100} \times M = 2 \times 14 = 28$

$\Rightarrow M = \frac{2800}{14 \times 10^{-3}} = 2 \times 10^5$

[D]

30. (A)

Average atomic mass =  $\frac{90 \times 20 + 21x + 22 \times (10 - x)}{100} = 20.11$

$x = 9\%$

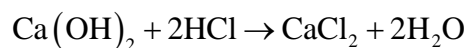
31. (B)

32. (C)

Moles of Ca(OH)<sub>2</sub> =  $\frac{6.023 \times 10^{23}}{6.023 \times 10^{23}} = 1$

Moles of HCl =  $\frac{3.01 \times 10^{22}}{6.02 \times 10^{23}} = 0.05$

HCl =  $\frac{3.01 \times 10^{22}}{6.02 \times 10^{23}} = 0.05$



(L.R.)

33. (A)

$$\text{Moles of CuSO}_4 = \frac{1.595}{1595} = 0.01$$

$$\text{Weight of solvent} = 100 - 1.595 = 98.505$$

$$\text{Volumes of solvent} = \frac{98.505}{1.2 \times 1000} = 82 \times 10^{-3} \text{ L}$$

$$\text{Molarity} = \frac{0.01}{82 \times 10^{-3}} = 0.12 \text{ M}$$

34. (B)

$$(A) \quad \text{atoms of O}_2 = \frac{2 \times 8}{32} \times 6.022 \times 10^{23} \sim 3 \times 10^{23}$$

$$(B) \quad \text{atoms of Be} = \frac{3}{9} \times 6.022 \times 10^{23} \sim 2 \times 10^{23}$$

$$(C) \quad \text{atoms of C} = \frac{8}{12} \times 6.022 \times 10^{23} \approx 4 \times 10^{23}$$

$$(D) \quad \text{atoms of F}_2 = \frac{19}{19} \times 6.022 \times 10^{23} \approx 1 \times 10^{23}$$

35. (C)

X	Y	X	Y	
$\frac{20}{10}$	$:\frac{80}{200}$	1	$:\ 2$	$\therefore \text{XY}_2$

36. (C)

Auogaduos hypothesis

37. (A)

$$\text{Moles of magnesium} = \frac{3}{24} \times \frac{2.68}{100} = 0.00335$$

$$\begin{aligned} \text{Number of magnesium atoms} &= 0.00335 \times 6.022 \times 10^{23} \\ &= 2.01 \times 10^{21} \text{ atoms.} \end{aligned}$$

38. (A)

$$\text{Moles of comphon} = \frac{25 \times 10^{-3}}{10 \times 12 + 16 + 16} = 0.164 \times 10^{-3}$$

$$\begin{aligned} \text{Number of atoms} &= 0.164 \times 10^{-3} \times 6.022 \times 10^{23} \\ &= 9.9 \times 10^{19} \end{aligned}$$

39. (D)

$$\text{Moles of e}^- = 52 + 2 = 54.$$

40. (B)

$$\text{Moles of Ag} = \frac{1}{107}.$$

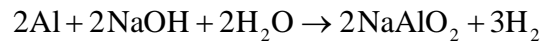
$$\text{Moles of Ag}_2\text{S required} = \frac{1}{107 \times 2}$$

$$\text{Mass of Ag}_2\text{S} = \frac{(107 \times 2 + 32)}{107 \times 2} = 1.1495$$

$$\text{Mass of ore required} = \frac{1.1495}{1.34} \times 100 = 85.78 \text{ g}$$

41. (D)

$$\text{Moles of Al} = \frac{27}{27} = 1$$



$$\text{Moles} \quad 2 \quad 2 \quad 2 \quad 2 \quad 3$$

$$\text{Given} \quad 1 \quad \text{excess} \quad \frac{3 \times 1}{2} = 1.5$$

(L.R.)

$$\text{Vol. of H}_2 \text{ evolved} = 1.5 \times 22.4 = 33.6 \text{ L.}$$

## WINDOW TO JEE MAINS

1. (A)

$$\text{Molarity} = \frac{n_{\text{soluble}}}{V_{\text{soluble}} (\text{Lt})}$$

$V_{\text{solution}}$  is affected by Temperature.

2. (C)

$$n_{\text{Fe}} = \frac{560}{56} = 10$$

$$\text{No. of atoms} = 10 N_A$$

$$\text{In 70 g of N} \quad \text{no. of atoms} = \frac{70}{14} \times N_A = 5 N_A$$

$$\text{In 20 g of H} \quad \text{no. of atoms} = \frac{20}{1} \times N_A = 20 N_A$$

3. (A)

4. (D)

5. (B)

$$\text{Molarity} = \frac{6.02 \times 10^{20}}{N_A \times 0.1} = 0.01$$

6. (C)

7. (C)

$$V = 1 \text{ L}$$

$$W_{\text{total}} = 1 \times 1.02 \times 1000 = 1020 \text{ g}$$

$$n_{\text{soluble}} = 2.05$$

$$W_{\text{total}} = \frac{352.8}{29} \times 100 = 1216.55 \text{ g}$$

$$= 1020 - 123 = 897 \text{ g}$$

$$\text{molality} = \frac{2.05}{0.897} = 2.28$$

8. (B)

9. (B)

$$V = 1 \text{ L}$$

$$n_{\text{soluble}} = 3.6$$

$$W_{\text{soluble}} = 3.6 \times 98 = 352.8$$

$$w_{\text{total}} = \frac{352.8}{29} \times 100 = 1216.55 \text{ g}$$

$$\text{density} = \frac{1216.55}{1000}$$

$$= 1.22 \text{ g/ml}$$

10. (C)                      11. (B)                      12. (C)                      13. (C)

14. (A)

$$\text{Number of atoms} = \frac{\text{weight}}{\text{atomic weight}} \times N_A \times \text{species}$$

∴ In 4 g of hydrogen

$$\text{Number of atoms} = \frac{4}{2} \times N_A \times 2 = 4N_A$$

[Here species = 2 because hydrogen is present as H<sub>2</sub>]

In 71 g of chlorine = 2N<sub>A</sub>

$$\text{Number of atoms} = \frac{71}{71} \times N_A \times 2 = 2N_A$$

In 127 g of iodine,

$$\text{Number of atoms} = \frac{127}{127} \times N_A \times 2 = 2N_A$$

In 48 g of magnesium,

$$\text{Number of atoms} = \frac{48}{24} \times N_A \times 1 = 2N_A$$

[Here Mg is present as Mg so species = 1]

Thus, the number of atoms are largest in 4 g of hydrogen.

15. (b)

Heavy water is D<sub>2</sub>O

In it,

$$\text{Number of } p^+ = 1 \times 2 + 8 = 10$$

$$\text{Number of } e^- = 1 \times 2 + 8 = 10$$

$$\text{Number of } n^0 = 1 \times 2 + 8 = 10$$

(∵ D have 1 n<sup>0</sup> because it is actually, <sup>1</sup>H<sup>2</sup>)

16. (d)

18 g H<sub>2</sub>O contains 2 g H

∴ 0.72 g H<sub>2</sub>O contains 0.08 g H.

44 g CO<sub>2</sub> contains 12 g C

∴ 3.08 g CO<sub>2</sub> contains 0.84 g C

$$\therefore \text{C} : \text{H} = \frac{0.84}{12} : \frac{0.08}{1} = 0.07 : 0.08 = 7 : 8$$

∴ Empirical formula = C<sub>7</sub>H<sub>8</sub>

17. (c)

3 M solution means 3 moles of solute (NaCl) are present in 1000 L of solution.

Mass of solution = volume of solution × density

$$= 1000 \times 1.252$$

$$= 1252 \text{ g}$$

Mass of solute = No. of mole × molar mass of NaCl

$$= 3 \times 58.5 \text{ g}$$

$$= 175.5 \text{ g}$$

Mass of solvent = (1252 – 175.5)g

$$= 1076.5 \text{ g}$$

$$= 1.076 \text{ kg}$$

$$\begin{aligned}\text{Molality} &= \frac{\text{moles of solute}}{\text{mass of solvent (in kg)}} \\ &= \frac{3}{1.076} = 2.79\text{m}\end{aligned}$$

18. (a)

$$\begin{aligned}\text{Final concentration, } M &= \frac{M_1V_1 + M_2V_2}{V_1 + V_2} \\ &= \frac{10 \times 2 + 200 \times 0.5}{200 + 10} \\ &= \frac{20 + 100}{210} \\ &= \frac{120}{210} = 0.57\text{M}\end{aligned}$$