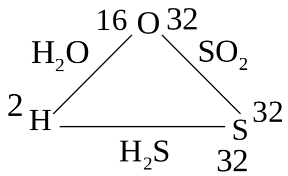
Mole Concept

EXERCISE - 1 [A]

1. **(D)**
None law is applicable in case of isotopes.

2. **(D)**
This is law of reciprocal proportions



3. **(B)**
Molecular formulae is always same law of constant composition.

4. **(A)**
Most stable isotope of carbon

5. **(D)**
The number of difference types of atoms in a molecule.

6. **(C)**
If volume of equal, then number of molecular are also same.

7. **(A)**

Moles of gas = $\frac{5.675}{22.7} = 0.25$

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 = $\frac{842}{6.022 \times 10^{23}} = 1.39 \times 10^{-21}\,g$.

9. **(A)**
1 mole contains Avogadro number of particles.

10. **(A)**

Moles of $N_2 = \frac{1.4}{28} = 0.05.$

Number of atoms = $0.05 \times 2 \times 6.02 \times 10^{23}$.

= 6.02×10^{22} .

11. **(D)**

(A) $\frac{22.7\times10^{3}}{22700}\times N_A = 6.022\times10^{23}$

(B) $\frac{22}{44}\times6.022\times10^{23} = 3.011\times10^{23}$

(C) $\frac{11.35}{22.7}\times6.022\times10^{23} = 3.011\times10^{23}$

(D) $0.1\times6.022\times10^{23} = 6.022\times10^{22}$

12. **(C)**

Number of gms of $H_2SO_4 = 0.25\times98 = 24.5$

13. **(D)**

Moles of $H_2 = \frac{1}{2} = 0.5$

Volume of H_2 in l = $0.5\times22.7 = 11.35l$.

14. **(D)**

Moles of Au = $\frac{19.7\times1000}{197} = 100$

Atoms of Au = $100\times6.022\times10^{23} = 6.022\times10^{25}$.

15. **(A)**

Mass of one molecule of CO_2 = $\frac{44}{6.02\times10^{23}}$ = 7.31×10^{-23}

16. **(C)**

Number of moles of $H_2 = \frac{0.227}{22.7} = 0.01$

17. **(B)**

Molar mas is mass of one mole substance.

18. **(B)**

$W_H = 3\times3 = 9\,g$ $\quad W_N = 3\times14 = 42\,g$

19. **(C)**

In one H_2O molecule: 10 proton, 8 neutrons, 10 electrons

Hence in 36 ml, $n_{H_2O} = \frac{36g}{18g/mol} = 2$ mol

$\therefore$ Protons = $2N_A\times10 = 20\,N_A$

20. **(A)**

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

21. **(B)**

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

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

22. (A)

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

23. (D)

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

24. (C)

$\frac{52\,amu}{4\,amu} = 13$

25. (B)

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

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

26. (D)

$n_C = 0.5 \times 6 = 3 \qquad \therefore$ wt = 36 g

27. (C)

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

28. (D)

$n_{H_2O} = \frac{180}{18} = 10$

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

29. (C)

$n_{Na_2S_2O_3 \cdot 5H_2O} = \frac{2.48}{248} = 0.01$

$\therefore\ nH_2O = 5 \times 0.01 \Rightarrow molecules = 0.05\,N_A$

30. (C)

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

31. (B)

$n_{H_2O} = \frac{18 \times 333}{54 + (96 \times 3) + (18 \times 18)} = 9.$

32. (C)

$n_{H_2O} = \frac{0.018}{18} = 10^{-3}$. Hence, molecules = $10^{-3} N_A$

33. (A)

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

34. **(D)**

$$n_C = 12 \times n_{C_{12}H_{22}O_{11}} = 12 \times \frac{3.42}{342} = 0.12$$

$\therefore$ atom = $0.12\,N_A \Rightarrow$

35. **(B)**

$$n_{MgCO_3} = \frac{8.4}{84} = 0.1$$

Each contain (12 + 6 + 24) protons

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

36. **(B)**

$$n_{total} = \frac{4.4}{44} + \frac{2.27}{22.7} = 0.2 \qquad \therefore \text{ molecules} = 0.2N_A$$

37. **(D)**

(i) $\frac{1}{1000} \times \frac{14}{58}$

(ii) $\frac{1}{1000} \times \frac{2}{28}$

(iii) $\frac{1}{1000} \times \frac{1}{23}$

(iv) $1\text{ml} \simeq 1\text{g}$ water

$$\frac{1}{18} \times 3$$

38. **(B)**

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

39. **(A)**

$$n_{Fe} = \frac{558.5}{55.85} = 10\,\text{moles}$$

In 60 g carbon, $n_C = 5$ $\qquad \therefore$ twice = 10 moles

40. **(B)**

Say $n_{Ca_3(PO_4)_2} = n$; then $n_O = 8n$

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

41. **(B)**

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

42. **(C)**

$$\frac{X}{100} \times \;\; 46 + 96 + 180 \;\; = 180 \Rightarrow X = 55.9$$

43. (C)

$n_I : n_O = \frac{25.4}{127} : \frac{8}{16} = \frac{1}{5} : \frac{1}{2} = 2:5$

Hence I_2O_5.

44. (A)

mol. Wt = 2 VD = 100

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

$w_{metal} = 29\,g$

45. (D)

$\underset{1}{CaCO_3} \xrightarrow{\Delta} \underset{1}{CaO} + \underset{1}{CO_2}$

Quantity of limes tones = wt. of one mole mole of $CaCO_3$

= 100 kg

46. (A)

Moles of $H_2S = 2$

Moles of $SO_2 = \frac{11.35}{22.7} = 0.5$

	SO_2	$+ 2H_2S$	$\rightarrow 3S$	$+ 2H_2O$
moles	1	2	3	2
given	0.5	2	$x = \frac{3 \times 0.5}{1} = 1.5$	
	L.R.			

47. (C)

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

Moles $2H_3PO_4 + 3Mg(OH)_2 \rightarrow Mg_3(PO_4)_2 + 6H_2O$

Moles 2 3 1 6

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

Weight of $H_3PO_4 = \frac{2 \times 1.724}{3} \times 98 = 112.6g$

48. (D)

$n_{H_2O} = n_{CH_3OH} \times 2 = 4$ $\therefore$ wt $= 4 \times 18 = 72g$

49. (A)

$W_O = 3.6769 - 2.0769 = 1.6g$

$2\,\text{mole}\,X \xrightarrow{\text{with}} 5\,\text{mole}\,'O'$

$'n'\text{moles} \xrightarrow{\text{with}} \frac{1.6}{16}\text{mole}\,'O'$

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

50. **(A)**

$$Ag_2CO_3 \xrightarrow{\Delta} 2Ag$$

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

51. **(D)** $n_{CO_2} = 2 \times n_{C_2H_5OH} = 2$

$\therefore W_{CO_2} = 2 \times 44 = 88\,g$

52. **(C)**

$$KClO_3 \xrightarrow{\Delta} KCl + 3/2\, O_2$$

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

53. **(A)**

$n_{Fe} = \frac{2}{3} \times n_{H_2O} = \frac{2}{3}$ $\quad \therefore W_{iron} = \frac{2}{3} \times 56 = 37.39$

54. **(B)**

$$n_{CaCO_3} = n_{CaO} = \frac{1.62}{56} = n_{CaCl_2} = 0.0289$$

% of $CaCl_2 = \frac{0.0289 \times 111}{10} \times 100 = 32.11\%$

55. **(D)**

	$3BaCl_2$	$+\,2Na_3PO_4$	$\rightarrow Ba_3(PO_4)_2$	$+\,6NaCl$
Moles	3	2	1	6
	0.5	0.2	$\frac{1 \times 0.2}{2} = 0.1$	
		(L.R.)		

56. **(A)**

$$Ca(OH)_2 + H_2SO_4 \longrightarrow CaSO_4 + 2H_2O$$

$Ca(OH)_2$: 0.2 (LR); H_2SO_4: 0.5

$$n_{CaSO_4} = n_{Ca(OH)_2} = 0.2$$

57. **(B)**

$$A + 2B \longrightarrow C + 3D$$

A: 5; B: 8 (LR)

$n_C = \frac{n_B}{2} = 4$; $n_D = 3 \times \frac{n_B}{2} = 12$

58. **(D)**

$$n : 4Al + 3C \longrightarrow Al_4C_3$$

Al: $\frac{1350}{27} = 50$ (L.R); C: $\frac{2400}{12} = 200$

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

59. **(D)**

$2A \longrightarrow 2B$

$B \longrightarrow 2C$

$3C \longrightarrow 4D$

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

$= \frac{32}{3}$

60. **(C)**

$\text{Mol.wt.} = 0.8 \times 28 + 0.2 \times 32 = 28.8$

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

61. **(A)**

$$D_{cl_2 \text{ wrt air}} = \frac{D_{cl_2}}{D_{air}} = \frac{M_{cl_2}}{M_{air}} \approx \frac{71}{29}$$

62. **(B)**

Say NO_X. Then $\frac{30.4}{100}(14+16x) = 14 \Rightarrow x = 2$

$$\therefore \ D_{\text{oxide wrt } O_2} = \frac{M_{\text{oxide}}}{M_{O_2}} = \frac{46}{32} = 1.44$$

63. **(B)**

$$\text{molality } = \frac{n}{w_{\text{solvent}}} \times 1000 \left(\text{urea : } NH_2\underset{\underset{O}{\|}}{C}NH_2 \right)$$

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

64. **(D)**

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

65. **(A)**

$$\left[Al^{3+}\right] = \frac{20 \times 0.2 \times 2}{40} = 0.2M$$

66. **(D)**

$1 \text{ mole } KMnO_4 \longrightarrow 5 \text{ moles } FeSO_4$

$V \times 0.01 \longrightarrow 50 \times 0.01$

$\Rightarrow V = 10mL$

67. **(B)**

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

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

68. **(A)**

3 molal $\Rightarrow$ 3 mole NaOH in 1000g solvent

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

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

69. **(B)**

Molarity of $NO_2CO_3 = \frac{2.65 \times 1000}{106 \times 250} = 0.1$ M.

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

70. **(A)**

$$X_{NaCl} = \frac{n_{NaCl}}{n_{NaCl} + n_{H_2O}} = \frac{1}{1 + \frac{1000}{18}} = 0.0177$$

EXERCISE - 1 [B]

1. (B)

Moles $= \frac{46\text{ g}}{23\text{ g}} = 2$

2. (A)

Number of atoms $= \frac{1.4}{14} \times 6.02 \times 10^{23} = 6.02 \times 10^{22}$

3. (C)

Moles of Aluminium $= \frac{54}{27} = 2$

$\therefore$ Mass of Magnesium atoms = 2 × 24 = 48 gm

4. (C)

Mass = 0.25 × 98 = 24.5 grams

5. (C)

Moles $= \frac{0.227}{22.7} = 0.01$

6. (A)

Number of atoms in 1 gram C_4H_{10} = $\frac{1}{58} \times 14 \times N_A$

Number of atoms in 1 gram $N_2 = \frac{1}{28} \times 2 \times N_A$

Number of atoms in 1 gram $Ag = \frac{1}{108} \times N_A$

Number of atoms in 1 gram $H_2O = \frac{1}{18} \times 3N_A$

7. (B)

Molecular weight of CO_2 and N_2O are same. So, ratio of molecules and Mass are same.

8. (A)

$n_{O_3} = \frac{3.2}{48} \Rightarrow$ Number of molecules = 4.0×10^{22}

9. (C)

Relative density $= \frac{\text{Ozone}}{\text{Oxygen}} = \frac{48}{32} = 1.5$

10. (A)

Volume can be added, volume $= \frac{\text{Mass}}{\text{density}}$

$$\underbrace{\frac{x}{d_1}}_{\text{Volume of gold}} + \underbrace{\frac{y}{d_2}}_{\text{Volume of quartz}} = \underbrace{\frac{x+y}{d}}_{\text{Total volume}}$$

11. (B)

$2NaOH + CO_2 \rightarrow Na_2CO_3$

Mole of CO_2 = $\frac{1.135}{22.7} = \frac{1}{20}$

So, moles of Na_2CO_3 = $\frac{1}{20}$

Mass of Na_2CO_3 = $\frac{1}{20} \times 106 = 5.3$ g

12. (D)

$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$

Mole of O_2 = $\frac{2.27}{22.7} = 0.1$

Mole of H_2O = 0.2

Mass of H_2O = 0.2 × 18 = 3.6 g

Density of H_2O is 1 gm/ml.

So, volume of H_2O is 3.6 ml

13. (C)

$2SO_2 + O_2 \rightarrow 2SO_3$

Volume of SO_2 is 5 L, so volume SO_3 is also 5 L.

14. (A)

$2SO_2 + O_2 \rightarrow 2SO_3$

Mole of SO_2 = $\frac{2}{64} = \frac{1}{32}$

Mole of SO_2 = mole of SO_3

Mass of SO_3 = 80 × $\frac{1}{32}$ = 2.5 gram

15. (C)

$2Fe + \frac{3}{2}O_2 \rightarrow Fe_2O_3$

Mole of $Fe_2O_3 = \frac{16}{160} = 0.1$

Therefore, mole of Fe = 0.2

Mass of Fe = 56 × 0.2 = 11.2 gram

16. (C)

$\underset{8\,\text{mole}}{2P} + \underset{5\,\text{mole}}{Q} \longrightarrow R$

P is limiting reagent. So, mole of R is 4.

17. (B)

Mole of P_4 = $\frac{31}{124} = \frac{1}{4}$

Mole of O_2 = $\frac{32}{32} = 1$

Applying POAC on phosphorous

$\frac{1}{4} \times 4 =$ mole of P_4O_6 × 4 + mole of P_4O_{10} × 4

$\frac{1}{4} =$ mole of P_4O_6 + mole of P_4O_{10} …… (1)

Applying POAC on oxygen

$1 \times 2 = \text{mole of } P_4O_6 \times 6 + \text{mole of } P_4O_{10} \times 10$ ......(2)

Solving (1) & (2), we get

Mole of P_4O_6 = $\frac{1}{8}$

Mole of P_4O_{10} = $\frac{1}{8}$

$\therefore$ Mass of $P_4O_6 = \frac{1}{8} \times 220 = 27.5$ gram

Mass of $P_4O_{10} = \frac{1}{8} \times 284 = 35.5$ gram

18. (A)

$\underset{1\,\text{mole}}{C} + \underset{0.75\,\text{mole}}{O_2} \rightarrow CO_2$

Mole of CO_2 = 0.75

Volume of $CO_2 = 0.75 \times 22.4 = 16.8$ L

19. (B)

Number of H^+ ions = $0.001 \times \frac{100}{1000} \times 2 \times 6.023 \times 10^{23}$

$= 12.046 \times 10^{49}$

$= 1.2 \times 10^{20}$

20. (C)

Moles of glucose $= \frac{6.02 \times 10^{22}}{6.02 \times 10^{23}} = 0.1$

Molarity $= \frac{0.1}{0.5} = 0.2$ M

21. (D)

Let mass of solvent = 1 kg
So, mole of solute = 0.2
Mass of solute = 0.2 × 98 = 19.6 gm
Therefore, mass of solution = 1019.6 gram

22. (C)

$0.25 = \frac{0.6 \times 250 + 0.2 \times 750}{250 + 750 + V}$

$1000 + V = \frac{300}{0.25} = 1200$

$V = 200$ ml

23. (A)

$[Ba^{2+}] = \frac{20 \times 0.6}{40} = 0.3$

24. (A)

$KClO_3 \xrightarrow{\Delta} KCl + \frac{3}{2}O_2 \quad , n_{O_2} = \frac{3}{2}$

$2Al + \frac{3}{2}O_2 \longrightarrow Al_2O_3$

$n_{Al_2O_3} = \frac{n_{O_2}}{\frac{3}{2}} = 1$

25. **(A)**

Consider 1 L solution

$\frac{29}{100} \times (d \times 1000) = \omega_{H_3PO_4} = 3.6 \times 98$

$\therefore$ d = 1.22 g/mL

26. **(A)**

$$\begin{array}{lcccc} & N_2 & + & 3H_2 & \longrightarrow & 2NH_3 \\ n: & 10 & & \underset{LR}{\boxed{15}} & & - \\ & 10-5 & & - & & 10\,\text{moles} \end{array}$$

$n_{N_2} = 5 \quad n_{H_2} = 0$

27. **(C)** $Fe_2(SO_4)_3 + 3BaCl_2 \longrightarrow 3BaSO_4 + 2FeCl_3$

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

$$\frac{n_{BaCl_2}}{3} = \frac{n_{FeCl_3}}{2} \Rightarrow n_{BaCl_2} = \frac{\frac{1}{2}}{2} \times 3 = 0.75\,\text{moles}$$

28. **(C)**

$3CuSO_4 + 2Al \longrightarrow Al_2(SO_4)_3 + 3Cu$

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

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

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

29. **(A)**

$$\begin{array}{ccccccc} CH_4 & + & 2O_2 & \longrightarrow & CO_2 & + & 2H_2O \\ 5 & & \boxed{8} & & - & & - \\ 5-4=1 & & - & & 4 & & 8 \end{array}$$

$\therefore n_{CO_2} = 4$; nCH_4 (remaining) = 1

30. **(C)**

$C_{10}H_X + nO_2 \longrightarrow 10CO_2 + \left(\frac{X}{2}\right)H_2O$

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

1 mole $C_{10}H_X \xrightarrow{\text{with}} \left(10 + \frac{X}{4}\right)$ moles

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

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

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

31. **(D)**

$100\text{g}\,CaCO_3 \xrightarrow{\text{with}} 2\text{mole HCl}$

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

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

32. (B)

$$n_{AgCl} = n_{Cl^-} = n_{HCl} = \frac{2.125}{143.5} = V(L) \times \text{Molarity}$$

$$\therefore \text{Molarity} = \frac{2.125 \times 1000}{143.5 \times 25} = 0.59$$

33. (D)

$$2X \xrightarrow{\text{with}} 3 \times 16\,g \text{ Oxygen}$$

$$1g \xrightarrow{\text{with}} 0.16\,g\,\text{Oxygen}$$

$$\therefore X = \frac{3 \times 16}{0.16 \times 2} = 150$$

34. (D)

$$2Al + \frac{3}{2}O_2 \longrightarrow Al_2O_3$$

n: n $^1/_2$

$$2 \times 27g\,Al \xrightarrow{\text{with}} \frac{3}{2}\text{mole}\,O_2$$

$$\omega \xrightarrow{\text{with}} {}^1/_2\,\text{mole}$$

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

35. (D)

$n_{BaSO_4} = n_{SO_2} = n_S$ (POAC on S)

$$= \frac{8}{32} = \frac{1}{4}$$

36. (B)

$$n_{NaBr} = n_1,\ n_{KBr} = n_2\,(\text{say})$$

$$n_{AgBr} = n_{Br} = n_1 + n_2 = \frac{0.97}{(108+80)} = 0.00516$$

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

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

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

37. (A)

$$A : n_H = 4 \times \frac{16g}{16g} = 4\,;\ B : n_H = 4 \times \frac{31.2}{76} = 1.64$$

$$C : n_H = 22 \times \frac{34.2}{342} = 2.2\,;\ D : n_H = 12 \times \frac{36}{180} = 2.4$$

38. (C)

Total atoms $= 200 + 0.05 \times N_A + 10^{-20} \times N_A$

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

39. **(C)**

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

$\therefore$ For 5 mol, (246×5)g = 1.23 kg

40. **(A)**

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

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

41. **(D)**

(i) 5g (ii) $\frac{60}{106.5} \times 35.5$ (iii) 0.1×35.5 (iv) 0.5×71

42. **(A)**

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

43. **(C)**

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

44. **(D)**

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

45. **(A)**

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

46. **(D)**

1 gram molecule: 44 g

1 molecule of CO_2 = 44 amu

47. **(A)**

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

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

$\therefore n_C : n_H = 1:5$

48. **(D)**

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

49. **(D)**

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

50. **(D)**

$12g\ H_2O$ $45g$ silica $43g$ others	$\xrightarrow{\Delta}$	$8\%\ H_2O$ $45g$ silica $43g$ others

100goriginal '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 $= \frac{45}{95.65} \times 100 = 47\%$

51. **(C)**

M_3N_2. 28 % nitrogen

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

52. **(D)**

$0.014\% \times \text{mol.wt} = 2 \times \text{at.wt of N}$

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

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

53. **(A)**

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

x = 9%

54. **(B)**

A. A. M = Mole fraction of $O^{18} \times 18 +$ Mole fraction of $O^{16} \times 16$

55. **(C)**

Moles of $Ca(OH)_2 = \frac{6.023 \times 10^{23}}{6.023 \times 10^{23}} = 1$

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

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

$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$

1 2 1

1 0.05 $\frac{0.05 \times 1}{2} = 0.025$

(L.R.)

56. **(A)**

Moles of $CuSO_4 = \frac{1.595}{1595} = 0.01$

Weight of solvent = 100 – 1.595 = 98.505

Volumes of solvent $= \frac{98.505}{1.2\times1000} = 82\times10^{-3}L$

Molarity $= \frac{0.01}{82\times10^{-3}} = 0.12M$

57. **(B)**

(A) atoms of $O_2 = \frac{2\times8}{32}\times6.022\times10^{23} \sim 3\times10^{23}$

(B) atoms of $Be = \frac{3}{9}\times6.022\times10^{23} \sim 2\times10^{23}$

(C) atoms of $C = \frac{8}{12}\times6.022\times10^{23} \simeq 4\times10^{23}$

(D) atoms of $F_2 = \frac{19}{19}\times6.022\times10^{23} \simeq 1\times10^{23}$

58. **(C)**

X		Y	X		Y	
$\frac{20}{10}$	:	$\frac{80}{200}$	1	:	2	$\therefore$ XY_2

59. **(C)**

Avogadro hypothesis $\Rightarrow$ If volumes are equal, then moles and number of molecules of gas are also same.

60. **(A)**

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

Number of magnesium atoms = $0.00335\times6.022\times10^{23} = 2.01\times10^{21}$ atoms.

61. **(D)**

Moles of comphon $= \frac{25\times10^{-3}}{10\times12+16+16} = 0.164\times10^{-3}$

Number of atoms $= 0.164\times10^{-3}\times6.022\times10^{23}\times27$ (1 Molecule has 27 atoms).

$= 2.67\times10^{21}$

62. **(D)**

Moles of $e^- = 52+2 = 54$.

63. **(B)**

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

Moles of Ag_2S required = $\frac{1}{107\times2}$

Mass of $Ag_2S = \frac{(107\times2+32)}{107\times2} = 1.1495$

Mass of ore required = $\frac{1.1495}{1.34}\times100=85.78g$

64. **(D)**

Moles of Al = $27/27=1$

$$2Al+2NaOH+2H_2O\rightarrow2NaAlO_2+3H_2$$

	Al	NaOH	H_2O	$NaAlO_2$	H_2
Moles	2	2	2	2	3
Given	1 (L.R.)	excess			$\frac{3\times1}{2}=1.5$

Vol. of H_2 evolved = $1.5\times22.4=33.6$ L.

JEE Main : PYQ

1. **(A)**

$$\text{Molarity}=\frac{n_{solute}}{V_{solution}\ \ Lt}$$

$V_{solution}$ is affected by Temperatuere.

2. **(C)**

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

No. of atoms = 10 N_A

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

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

3. **(A)**

Mole ratio of C : H : N

$\frac{9}{12}:\frac{1}{1}:\frac{3.5}{14}$

$\frac{3}{4}:\frac{1}{1}:\frac{1}{4}$

3 : 4 : 1

Empirical formula $=C_3H_4N$

Empirical formula mass $=36+4+14$

$=54$

$$n=\frac{108}{54}=2$$

Molecular formula $=C_3H_4N\times2$

$=C_6H_8N_2$

4. **(D)**

$$2BCl_3+3H_2\rightarrow2B+6HCl$$

$$\frac{\text{no. of moles of } H_2}{\text{no. of moles of B}}=\frac{3}{2}$$

No. of moles of $H_2 = \frac{3}{2} \times \frac{21.6}{10.8} = 3$

Volume of $H_2 = 3 \times 22.4\,L = 67.2L$ (Molar volume of any gas at N.T.P = 22.4 L)

5. **(B)**

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

6. **(C)**

1 mole is defined as number of atoms present in 12 g C and i.e. 6.022×10^{23}.
Since this number remains unchanged, mass of 1 mole substance will remain unchanged.

7. **(C)**

V = 1 L

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

N_{solute} = 2.05

W_{SOLUTE} = $2.05 \times 60 = 123$

$W_{solvent}$ = 1020 – 123 = 897 g

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

8. **(B)**

$$\frac{\text{no. of moles of oxygen atom}}{\text{no. of moles of } Mg_3(PO_4)_2} = \frac{8}{1}$$

No. of moles of $Mg_3(PO_4)_2 = \frac{0.25}{8}$

$= 0.03125$

9. **(A)**

V = 1L

N_{solute} = 3.6

$W_{solute} = 3.6 \times 98 = 352.8$

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

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

= 1.22 g/ml

10. **(C)**

$$2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^-(aq) + 3H_2(g)$$

Per mole of HCl, no. of moles of

H_2 formed $= \frac{1}{2}$

Volume of H_2 at STP $= \frac{1}{2} \times 22.4$ (Old data NTP)

$= 11.2L$

11. **(B)**

Molality $= 5.2\,m$.

i.e. if wt. of $H_2O = 1000gm$

then no. of moles of $CH_3OH = 5.2$

$$X_{CH_3OH} = \frac{5.2}{5.2 + \frac{1000}{18}} = 0.0856$$

12. **(C)**

Volume of solution $= \frac{(1000+120)}{1.15} m\ell$

$= \frac{1120}{1.15} m\ell$

Molarity $= \frac{120 \times 1.15 \times 1000}{60 \times 1120} = 2.05M$

13. **(C)**

Molarity$= \frac{(750 \times 0.5) + (250 \times 2)}{750 + 250} = 0.875M$

14. **(A)**

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

$\therefore$ In 4 g of hydrogen

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

[Here species = 2 because hydrogen is present as H_2]

In 70 g of chlorine = $2N_A$

Number of atoms $= \frac{70}{71} \times N_A \times 2 \simeq 2N_A$

[Here chlorine is taken as Cl_2]

In 127 g of iodine,

Number of atoms = $\frac{127}{254} \times N_A \times 2 = N_A$

[Here iodine is taken as I_2]

In 48 g of magnesium,

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_2O

In it,

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

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

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

($\because$ D has 1 n^0 because it is actually, ${}_1H^2$)

16. **(D)**

18 g H_2O contains 2 g H

$\therefore$ 0.72 g H_2O contains 0.08 g H.

44 g CO_2 contains 12 g C

$\therefore$ 3.08 g CO_2 contains 0.84 g C

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

$\therefore$ Empirical formula = C_7H_8

17. **(C)**

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

Mass of solution = volume of solution $\times$ density

$=1000\times1.252$

= 1252 g

Mass of solute = No. of mole $\times$ molar mass of NaCl

$=3\times58.5g$

= 175.5 g

Mass of solvent = (1252 – 175.5)g

= 1076.5 g

= 1.076 kg

$$\text{Molality}=\frac{\text{moles of solute}}{\text{mass of solvent in kg}}$$

$$=\frac{3}{1.076}=2.79m$$

18. **(A)**

Final concentration, $M=\frac{M_1V_1+M_2V_2}{V_1+V_2}$

$$=\frac{10\times2+200\times0.5}{200+10}$$

$$=\frac{20+100}{210}$$

$$=\frac{120}{210}=0.57\,M$$

19. **(B)**

$$\frac{N_{O_2}}{N_{N_2}}=\frac{n_{O_2}}{n_{N_2}}=\frac{W_{O_2}/M_{O_2}}{W_{N_2}/M_{N_2}}=\frac{W_{O_2}}{W_{N_2}}\times\frac{M_{N_2}}{M_{O_2}}=\frac{1}{4}\times\frac{28}{32}$$

$$=\frac{7}{32}$$

20. **(B)**

$BaCl_2$ +	$H_2SO_4 \rightarrow$	$BaSO_4+2HCl$
20.8gm	4.9gm	0.05 mole
$=\frac{20.8}{208}$ mole	$=\frac{4.9}{98}$ mole	$=0.05\times233gm$
$=0.1$mole	$=0.05$mole	$=11.65gm$

21. **(B)**

Volume of solution $=\frac{1000+120}{1.12}$ ml

$=1000ml$

Molarity $=\frac{120\times1000}{60\times1000}=2M$

22. **(D)**

Molecular mass of compound $=16\times 2=32\text{gm}$

% of H in $N_2H_4=\frac{4}{32}\times 100$

12.5%

23. **(A)**

No. of moles of acetic acid adsorbed by 3gm charcoal

$=\left(0.6-0.042\right)\times 50\times 10^{-3}$

$=9\times 10^{-4}\text{mole}$

Wt. adsorbed by $=9\times 10^{-4}\times 60\,\text{gm}$

3gm $=0.054\text{gm}$

Wt. adsorbed per gram $=\frac{0.054}{3}=0.018\text{gm}$

$=18\text{mg}$

24. **(C)**

$A \quad + \quad 2B \quad + \quad 3C \rightleftharpoons AB_2C_3$

= $\frac{6}{60}\text{mole}$ 1mole 0.036 mole

$=0.1\text{mole}$

C is limiting reagent

No. of moles of AB_2C_3 formed $=0.012$

Wt. of AB_2C_3 formed $=4.8\text{gm}$

Molecular wt. of $AB_2C_3=\frac{4.8}{0.012}=400$

$60+2x+\left(3\times 80\right)=400$

$x=50$

25. **(B)**

$BaCl_2.xH_2O$

$\frac{18x}{208+18x}=\frac{9}{61}$

$208+18x=122x$

$x=2$

26. **(B)**

$8=\frac{1\times 32}{x}\times 100$

$x=400$

27. **(B)**

$C_xH_y+\left(x+\frac{y}{4}\right)O_2\rightarrow xCO_2+\frac{y}{2}H_2O$

5 25

$\frac{x+\frac{y}{4}}{1}=\frac{25}{5}=5$

$x+\frac{y}{4}=5$

C_3H_8

28. (C)
No. of Fe atoms in 3.3 g of haemoglobin
$\frac{0.34}{100}\times\frac{3.3}{56}\times 6.022\times 10^{23} = 1.206\times 10^{20}$

29. (D)

C	74%	$\frac{74}{12}=6.16$	$\frac{6.16}{1.23}=5$
N	17.3%	$\frac{17.3}{14}=1.23$	$\frac{1.23}{1.23}=1$
H	8.7%	$\frac{8.7}{1}=8.7$	$\frac{8.7}{1.23}=7$

Empirical formula $= C_5NH_7$
Empirical weight $=(12\times 5)+(14\times 1)+(1\times 7)=81\text{amu}$
Multiplying factor $=\frac{\text{Molecular weight}}{\text{Empirical weight}}=\frac{162}{81}=2$
Molecular formula $=2\times$ (Empirical formula) $C_{10}N_2H_{14}$

30. (C)
Let total volume $=1000\,\text{mL}=1\text{L}$
Total mass of solution $=1460\,\text{g}$
Mass of $\text{HCl}=\frac{35}{100}\times 1460$
Moles of $\text{HCl}=\frac{35\times 1460}{100\times 36.5}$
So molarity $=\frac{35\times 1460}{100\times 36.5}=14\text{M}$

31. (C)
Except(C) all postulates were given by Dalton.

32. (D)
CH_4 has one atom of carbon among 5 atoms $(1C+4H)$.
$\therefore$ Mole % of $C=\frac{1}{5}\times 100=20\%$

33. (D)
Given percentage of chlorine in chlorohydrocarbon $=3.55\%$ i.e. 100 g of chlorohydrocarbon has 3.55g of chlorine. 1 g of chlorohydrocarbon will have $\frac{3.55}{100}=0.0355\text{g}$ of chlorine
Atomic wt. of $\text{Cl}=35.5\,\text{g/mol}$
Number of moles of $\text{Cl}=\frac{0.0355\,\text{g}}{35.5\,\text{g/mol}}=0.001\text{mol}$
Number of atoms of $\text{Cl}=0.001\text{mol}\times 6.023\times 10^{23}\text{mol}^{-1}$
$=6.023\times 10^{20}$

34. (B)

In 100g solution, mass of carbon =10.8 g

250 g solution, mass of carbon $= \dfrac{10.8 \times 250}{100} = 27g$

Mass of C in one mole of glucose $(C_6H_{12}O_6) = 12 \times 6 = 72g$

72 g of C is present in $= 180g$ glucose

27 g of C is present in $= \dfrac{180}{72} \times 27 = 67.5\,g$ glucose

Mass of solvent(water) $= 250 - 67.5 = 182.5\,g$

Molality of solution $= \dfrac{(67.5/180)\,mol}{(182.5/1000)\,kg} = 2.05\,m$

35. (C)

16 moles of NaOH neutralizes 16 moles of H^+ Source of $H^+ \rightarrow 2$ moles of $HCl + 1$ mol H_2SO_4.

$\therefore 1mol\ SO_2Cl_2$ is producing $4\,mol\,H^+$ ions

$\therefore$ No. of moles of $SO_2Cl_2 = \dfrac{16}{4} = 4\,moles$

36. (C)

Molecular weight of $Fe_3O_4 = 232\,g/mol$

Moles of $Fe_3O_4 = \dfrac{4.640 \times 10^3}{232} = 20$

Moles of $CO = \left[\dfrac{\text{given mass}}{\text{molar mass}}\right] = \dfrac{2.52 \times 10^3}{28} = 90$

So limiting Reagent

$= Fe_3O_4\,(20\,\text{mole}\,Fe_3O_4\ \text{required}\,80\,\text{mole}\,CO)$

So moles of Fe formed $= 60$

Weight of $Fe = (\text{moles} \times \text{molar mass}) = 60 \times 56 = 3360$

37. (C)

$$C_xH_y + \left(x + \frac{y}{4}\right)O_2 \rightarrow xCO_2 + \frac{y}{2}H_2O$$

$$C_{15}H_{30} + \frac{45}{2}O_2 \rightarrow 15CO_2 + 15H_2O$$

Mass of fuel $= 0.756 \times 1000g$

No. of moles of fuel $= \dfrac{0.756 \times 1000}{210}$

Wt. of oxygen $= \dfrac{0.756 \times 1000}{210} \times \dfrac{45}{2} \times 32 = 2592\,g$

Wt. of $CO_2 = \dfrac{0.756 \times 1000}{210} \times 15 \times 44 = 2376\,g$

38. (B)

44g of CO_2 contains 12 g of C

So, 2.64 of CO_2 contains $\dfrac{12}{44} \times 2.64 = 0.72\,gC$

1.08 g of H_2O contains $\frac{2}{18}\times 1.08 = 0.12\,gH$

$\therefore$ Mass of oxygen present $= 1.80 - (0.72 + 0.12) = 0.96g$

% of $O = \frac{0.96}{1.80}\times 100 = 53.33\%$

39. (D)

5 mol AB_2 weighs 125g

$\therefore AB_2 = 25g/mol \Rightarrow M_A + 2M_B = 25$

10 mol A_2B_2 weighs 300g

$\therefore A_2B_2 = 30\,g/mol \Rightarrow 2M_A + 2M_B = 30$

$\therefore$ Molar mass if $A(M_A) = 5g$ or $5\times 10^{-3}kg$

Molar mass of $B(M_B) = 10\,g$ or $10\times 10^{-3}kg$

40. (A)

(A) $4Fe + 3O_2 \longrightarrow 2Fe_2O_3$

1g of Fe requires $= \frac{3\times 32}{4\times 56} = 0.43g$ of oxygen

(B) $P_4 + 5O_2 \longrightarrow P_4O_{10}$

1g of P requires $= \frac{5\times 32}{31\times 4} = 1.3g$ of oxygen

(C) $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

1g of C_3H_8 requires $= \frac{5\times 32}{44} = 3.6\,g$ of O_2

(D) $2Mg + O_2 \longrightarrow 2MgO$

1g of Mg requires $= \frac{32}{2\times 24}g = 0.66\,g$ of O_2

41. (D)

No. of moles of oxygen in 0.16 g of oxygen molecule $= \frac{0.16g}{32\,g/mol} = 0.005\,mol$

$2NaClO_3 \xrightarrow{\Delta} 2NaCl + 3O_2$

According to the reaction

3 moles of $O_2 = 2$ moles of $NaCl = 2$ moles of $AgCl$

Molar mass of $AgCl = 143.5g/mol$

0.005 moles of O_2 will ppt. $= 0.005\times\frac{2}{3}$ moles AgCl

$= 0.0033$ moles of AgCl

$\therefore$ Mass of AgCl (in g) obtained will be

$= 143.5h/mol \times 0.0033\,moles = 0.48g$

42. (B)

Given chemical equation:

$\underset{1g}{M_2CO_3} + 2HCl \rightarrow 2MCl + H_2O + \underset{0.01186\,mol}{CO_2}$

Moles of M_2CO_3 = moles of CO_2

$$\frac{1}{\text{Molar mass of } M_2CO_3} = 0.01186$$

$\therefore$ Molar mass of $M_2CO_3 = \frac{1}{0.01186}$

Molar mass $= 84.3 g/mol$

43. (2)

$\underset{1mol}{X} + \underset{1mol}{Y} + + \underset{0.05mol}{3Z} \rightleftharpoons XYZ_3$

Z is a act as a limiting reagent

1mol of $XYZ_3 = \frac{0.05}{3}$ mol of Z

Mass of $XYZ_3 = \frac{0.05}{3} \times (10 + 20 + 30 \times 3) = 2g$

44. (24)

Let the weight of Mg in the extract $= x$ g

$\frac{x}{2000} \times 10^6 = 48$ [Assuming 1000 mL $\approx$ 1000 kg for water]

$x = 96 \times 10^{-3}$

$n_{Mg} = \frac{\text{weight}}{\text{molar mass}} = \frac{96 \times 10^{-3}}{24} = 0.004$

Number of Mg atom $= 0.004 \times 6.02 \times 10^{23}$

$= 24.08 \times 10^{20} \approx 24 \times 10^{20}$

45. (46)

	N_2	$+ 3H_2 \longrightarrow$	$2NH_3$
Initial	56L		–
	$-10L$		$+20L$
final	46L		20L

From the stoichiometry for 2L production of ammonia 1L of N_2 gas is used

Final volume of $N_2 = 56 - 10 = 46L$

46. (46)

Mole of CO_2 =Moles of C

$$\frac{\text{Weight of } CO_2}{\text{Molar mass of } CO_2} = \frac{0.793}{44}$$

Weight of 'C' = moles $\times$ molar mass of carbon

$\frac{0.793}{44} \times 12 = 0.216g$

$1H_2O \longrightarrow [2H + O]$

1 mole of $H_2O = 2$ moles of hydrogen

Moles of $H_2O = \frac{\text{Weight}}{\text{Molar mass}} = \frac{0.442}{18}$

Moles of 'H' $= \frac{0.442}{18} \times 2$

Weight of 'H' $= \frac{0.442}{18} \times 2 \times 1 = 0.049 g$

$\therefore$ Weight of $'O' = 0.492 - 0.216 - 0.049 = 0.227g$

% of 'O' $= \frac{0.227}{0.492} \times 100 = 46.13\%$

47. (2)

Moles of A_2B = Moles of $AB_3 = 0.15$

$\frac{w}{2a+b} = \frac{w}{a+3b} \Rightarrow 2a + b = a + 3b \Rightarrow a = 2b$

48. (5418)

M.M of $C_7H_5N_3O_6$ is $84 + 5 + 42 + 96 = 227$

Moles of $C_7H_5N_3O_6 = \frac{681}{227} = 3$

Moles of N atoms $= 3 \times 3 = 9$

Number of N atoms $= 9 \times 6.02 \times 10^{23} = 5418 \times 10^{21}$

49. (2)

No. of atoms $= \frac{8}{23} \times 6.02 \times 10^{23} = 2.09 \times 10^{23}$

$= 2 \times 10^{23}$

50. (14.00)

Mass percent of $HNO_3 = 63$

Thus, 100 g of nitric acid solution contains 63 g of nitric acid by mass.

No. of moles $= \frac{63\,g}{63\,g\,mol^{-1}} = 1$

Volume of 100 g of nitric acid solution

$= \frac{Mass}{Density} = \frac{100g}{1.4\,g/mL} = 71.4\,mL$

Molarity $= \frac{\text{No.of moles}}{\text{volume}(mL)} \times 1000 = \frac{1}{71.4} \times 1000 = 14M$

51. (46)

0.492 g of $C_xH_yO_z$

The moles are calculated as shown below:

Moles of $CO_2 = \frac{0.7938\,g}{44g\,mol^{-1}} = 0.018\,mol$

Moles of $H_2O = \frac{0.4428g}{18\,g\,mol^{-1}} = 0.246\,mol$

Mass of $C = 0.018 \times 12 = 0.216\,g$

Mass of $H = 0.049 \times 1 = 0.049g$

$\therefore$ wt of Oxygen =Mass of sample $-$mass of C $-$ mass of H

$= 0.492 - 0.216 - 0.049 = 0.227\,g$

% of Oxygen $= \frac{0.227}{0.492} \times 100 = 46$ (approx.).

52. (25)

There will be min. one molecule of glycine.

$0.30\%\text{glycine} = 75g$

1% of protein $= \frac{75}{0.30}$ g

100% of protein $= \frac{75}{0.30} \times 100\text{g} = 25000\text{g} = 25 \times 10^3$ g

53. (13)

$Na_2O + H_2O \rightarrow 2NaOH$

Moles of $Na_2O = \frac{20}{62}$ moles

Moles of NaOH formed $= \frac{20}{62} \times 2 = \frac{40}{62}$

$[NaOH] = \frac{40 \times 1000}{62 \times 500} = 1.29\text{M} = 13 \times 10^{-1}\text{M}$

54. (4)

Concentration of glucose in blood $= 0.72\,\text{g}/\text{L}$

$= \frac{0.72}{180} = 4 \times 10^{-3} \text{mol}/\text{L}$.

55. (3)

Weight of H in 210 g of $H_2O = \frac{210}{18} \times 2 = 23.333\text{g}$

% of $H = \frac{23.333}{750} \times 100 = 3.111 = 3$

56. (2)

$M = \frac{4.5/90}{250/1000} = 0.2 = 2 \times 10^{-1}$

57. (47)

Let total mole of solution $= 1$

So, mole of glucose $= 0.1$

Mole of $H_2O = 0.9$

% (w/w) of $H_2O = \left[\frac{0.9 \times 18}{0.9 \times 18 + 0.1 \times 180}\right] \times 100$

$= 47.368 = 47.37$

58. (10.00)

$\text{ppm} = \frac{10.3 \times 10^{-3}}{1.03 \times 1000\text{g}} \times 10^6 = 10$