<H1> Additional Objective Questions

<H2> Single Correct Choice Type

1. (B)

2. (A)

3.(C)

4.(D) We know

$$\text{Density}(\rho) = \frac{\text{Volume}(V)}{\text{Mass}(M)}$$

Or
$$M = \frac{V}{\rho} \qquad (1)$$

Substituting the values in Eq. (1), we get

$$M = \frac{20.0}{1.27} = 15.7\ \text{g}$$

5.(A) The reactions are

$$\underset{\substack{245\ \text{g} \\ 5.104\ \text{g}}}{2\text{KClO}_3} \rightarrow 2\text{KCl} + \underset{\substack{96\ \text{g} \\ x\ \text{g}}}{3\text{O}_2}$$

From the stoichiometry, we have

$$x = \frac{96\ \text{g}}{245\ \text{g}} \times 5.104\ \text{g} = 2\ \text{g of } \text{O}_2$$

When liberated oxygen react with hydrogen, we have

$$\underset{\substack{4\ \text{g} \\ y\ \text{g}}}{2\text{H}_2} + \underset{\substack{32\ \text{g} \\ 2\ \text{g}}}{\text{O}_2} \rightarrow \underset{36\ \text{g}}{2\text{H}_2\text{O}}$$

The amount of hydrogen reacted with liberated hydrogen is

$$y = \frac{4\ \text{g}}{32\ \text{g}} \times 2\ \text{g} = 0.25\ \text{g of } \text{H}_2$$

When zinc react with sufficient amount of dil. HCl, we have

$$\underset{\substack{65\ \text{g} \\ z\ \text{g}}}{\text{Zn}} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \underset{\substack{2\ \text{g} \\ 0.25\ \text{g}}}{\text{H}_2} \uparrow$$

The amount of zinc reacted to produced 0.25 g of hydrogen is

$$z = \frac{65\ \text{g}}{2\ \text{g}} \times 0.25\ \text{g} = 8.125\ \text{g}$$

6.(B) Given that density of octane = 2.65 kg gallon^{-1}

1 gallon of octane weighs 2.65 kg (2650 g).

$$\text{Number of moles of octane } (\text{C}_8\text{H}_8) = \frac{2650}{114} = 23.246\ \text{mol}$$

$$\text{C}_8\text{H}_8 + n\text{O}_2 \rightarrow x\text{CO} + (8 - x)\text{CO}_2 + 9\text{H}_2\text{O}$$

Here,
$$n = \text{Number of moles of oxygen} = \frac{1}{2}(x + 16 - 2x + 19) = \frac{1}{2}(25 - x)$$

Total mass of the product is

$$23.246 \times 28x + (8-x) \times 44 \times 23.246 + 9 \times 23.246 \times 18 = 11530$$
$$650.9x + 8182.6 - 1022.8x + 3765.8 = 11530$$
$$-371.9x + 11948.4 = 11530$$
$$-371.9x = -418.4$$
$$x = 1.125$$

Hence, $n = \frac{1}{2}(25 - 1.125) = 11.9375$

In case of complete combustion, $C_8H_8 + \frac{25}{2}O_2 \rightarrow 8CO_2 + 9H_2O$

$\text{Efficiency} = \frac{11.9375}{12.5} \times 100 = 95.5\%$

7.(B) For the reaction,

$$CaCl_2 + 2AgNO_3 \rightarrow 2AgCl + Ca(NO_3)_2$$

We have $n = \frac{4.31}{143.5}$ and so, moles of $CaCl_2 = \frac{4.31}{143.5} \times \frac{1}{2} = 0.015\,\text{mol}$

8.(C) $4HCl + MnO_2 \rightarrow MnCl_2 + Cl_2 + 2H_2O$

We have $n = \frac{5}{87}$, so

Moles of HCl reacted $= \frac{5}{87} \times 4 = 0.05747\,\text{mol}$

Mass of HCl = 0.05747 × 36.5 = 8.4 g

9.(A) $\text{Molarity} = \frac{\text{Molecular weight} \times \text{Volume required}}{\text{Weight required} \times 1000} = \frac{57.8 \times 50}{3.045 \times 1000} = 0.958\,\text{M}$

10.(D) For the given reaction,

$$S + O_2 \rightarrow SO_2$$

Moles of SO_2 produced from 8 g of sulphur = 16/64 = 0.25

When liberated SO_2 reacts with Cl_2-water, we have

$$SO_2 + Cl_2\text{-water} \rightarrow SO_4^{2-} + 2Cl^-$$

Moles of SO_4^{2-} produced = Moles of SO_2 = 0.25

When sulphate so produced precipitated with $BaCl_2$, we have

$$SO_4^{2-} + BaCl_2 \rightarrow BaSO_4 + 2Cl^-$$

Moles of $BaSO_4$ produced = Moles of $SO_4^{2-} = 0.25$

11.(A) Molecular mass of NaCl is 58.5.

1 molal contains 58.5 g in 1000 L

1 molal contains 5.85 g in 100 mL

Now, 1 molal contains 5.85 g

Given that x molal contains 400×10^{-3} g

Therefore, $x = \dfrac{400 \times 10^{-3}}{5.85} = 0.0685\ \text{M}$

12.(A) From the given reaction,

$$\underset{80\ \text{g}}{TiO_2} \rightarrow \underset{\substack{48\ \text{g} \\ 100.0\ \text{kg}}}{Ti} + \underset{32\ \text{g}}{O_2}$$

80 g TiO_2 gives 48 g of Ti and *x* g TiO_2 gives 100×10^3 g of Ti.

Therefore, $$x = \frac{80 \times 100 \times 10^3}{48} = 166.7\ \text{g}$$

13. (C) From the question, we have

Element	**Symbol**	**Percentage**	**Relative no. of moles**	**Simplest ratio of moles**	**Simplest whole number ratio**
Nitrogen	N	35	$\frac{35}{14} = 2.5$	$\frac{2.5}{2.5} = 1 \times 2$	2
Oxygen	O	60	$\frac{60}{16} = 3.75$	$\frac{3.75}{2.5} = 1.5 \times 2$	3
Hydrogen	H	5	$\frac{5}{1} = 5$	$\frac{5}{2.5} = 2 \times 2$	4

Therefore, empirical formula $N_2H_4O_3$.
$N_2H_4O_3$ is nothing but NH_4NO_3.

14.(D) Milliequivalent of $Ba(MnO_4)_2$ reacted = Milliequivalent of H_2O_2 reacted

$$\frac{56 \times 100}{5.6} = 1000$$

Mass equivalent of H_2O_2 = 1 equivalent of H_2O_2
Therefore, Moles of $Ba(MnO_4)_2$ (*n*-factor = 10) = 0.1 mol
and Weight of $Ba(MnO_4)_2$ = 0.1 × 375 g = 37.5 g

Therefore, $\%\ \text{purity of}\ Ba(MnO_4)_2 = \dfrac{37.5}{55} \times 100 = 68.18\%$

15.(D) We know

1 vol. = 0.303 %.

Therefore, 20 vol. = 20 × 0.303 % = 6.06%

16.(B) From the given data, we have

Element	**% (*a*)**	**Atomic weight (*b*)**	***a*/*b***	**Ratio**
X	50	10	5	2
Y	50	20	2.5	1

So, the simplest formula = X_2Y.

17.(A) From the property of solution, we have

$$N_A V_A + N_B V_B = N_f V_f \quad (1)$$

Substituting the values in Eq. (1), we get

$$0.5\times V_A + 0.1\times V_B = 0.2\times 2$$

Or $$5V_A + V_B = 4$$

Working out with each option, we get option (A) to the correct choice.

18.(B) We know

$$\rho = M\left(\frac{1}{m} + \frac{\text{Mol. wt.}}{1000}\right) \qquad (1)$$

Substituting the values in Eq. (1), we get

$$1.0585 = 1\left(\frac{1}{m} + \frac{58.5}{1000}\right)$$

Or $$m = \frac{1}{1.0585 - 0.0585} = 1 \text{ molal}$$

19.(C) We know

$$N_1V_1(\text{before dilution}) = N_2V_2(\text{after dilution}).$$

Normality of H_2SO_4 = 0.2 × 2 = 0.4 N.

Therefore, $0.4\times 1 = N_2 \times 1000 \Rightarrow N_2 = 4\times 10^{-4}$

20.(D) We know

$$N_AV_A + N_BV_B = N_fV_f \qquad (1)$$

Substituting the values in Eq. (1), we get

$$N_f = \frac{100\times 0.2 + 100\times 0.2}{200} = 0.2 \text{ N}$$

21.(B) The reaction involved is

$$NaH_2PO_4 + 2NaOH \rightarrow Na_3PO_4 + 2H_2O$$

From the reaction, 1 mol NaH_2PO_4 reacts with 2 mol NaOH

Number of moles of NaH_2PO_4 = $\frac{12}{120} = 0.1$ mol

Therefore, number moles of NaOH = 2 × 0.1 = 0.2 mol

Given that molarity of NaOH = 1 M, so

$$1 = \frac{0.2}{V}\times 1000 \Rightarrow V = 200 \text{ mL}$$

22.(C) Moles $H_2S = \frac{17}{M_{H_2S}} = \frac{17}{34} = \frac{1}{2}$

Also, 1 mol $H_2S \equiv 5$ mol of H_2SO_4 (from stoichiometry of reaction)

or $\frac{1}{2}$mol of $H_2S \equiv \frac{5}{2}$ mol of $H_2SO_4 = M\times V_L \Rightarrow V_L = \frac{2.5}{0.1} = 25.0$ L

23.(C) Let the volume the of H_2O_2 = x mL

$$2H_2O_2 \rightarrow 2H_2O + O_2\uparrow$$

Then milliequivalent of H_2O_2 = milliequivalent of O_2

$$x \text{ mL} \times \frac{22.4}{5.6} N = \frac{2240}{22400} \times 4 \times 1000 \Rightarrow x = 100 \text{ mL}$$

24.(B) The amount of $CaCl_2$ in terms of $CaCO_3$ is

$$55.5 \text{ g } CaCl_2 \equiv 50 \text{ g } CaCO_3$$

$$\Rightarrow \quad 1 \text{ mg } CaCl_2 \equiv \frac{50}{55.5} \text{ mg } CaCO_3 \equiv 0.9 \, CaCO_3 \text{ mg}$$

The amount of $MgCl_2$ in terms of $CaCO_3$ is

$$47.5 \text{ g } MgCl_2 \equiv 50 \text{ g } CaCO_3$$

$$\Rightarrow \quad 1 \text{ mg } MgCl_2 = \frac{50}{47.5} \text{ mg } CaCO_3 \equiv 1.05 \, CaCO_3$$

Therefore, the hardness in $CaCO_3$ (ppm) $\equiv \dfrac{(0.9 + 1.05) \times 10^{-3} \text{ g}}{1/1000} \equiv 2.15 \text{ ppm}$

25.(B) From the reaction, we have

$$CaCl_2 + NaCl \xrightarrow{Ca_3^{2-}} CaCO_3 \downarrow \xrightarrow{\Delta} CaO + CO_2$$

$$\text{Moles of } CaO = \frac{1.62}{56} \equiv \text{Moles of } CaCO_3 \equiv \text{Moles of } CaCl_2 = \frac{\text{Grams of } CaCl_2}{111}$$

So, $\quad \text{Grams of } CaCl_2 = 3.21 \text{ g} \Rightarrow \% \, CaCl_2 = \dfrac{3.21}{10} \times 100 = 32.1\%$

26.(B) From the given data, we have

$$224 \text{ ppm } HCO_3^- \equiv 244 \text{gm } HCO_3^- \text{ in } 100 \text{ L} \equiv 244 \text{mg } HCO_3^- \text{ in} 1.0 \text{ L}$$

$$\equiv 4 \text{ mmoles of } HCO_3^- \text{ in } 1.0 \text{ L}$$

$$\equiv 2 \text{ mmoles of } Ca(HCO_3)_2 \text{ in } 1.0 \text{ L}$$

$$CaO + Ca(HCO_3)_2 \longrightarrow 2CaCO_3 + H_2O \equiv 2 \text{ mmoles } CaO \text{ in } 1.0 \text{ L}$$

$$\equiv 2 \times 56 \equiv 112 \text{ mg } CaO$$

27.(A) For 40% *w*/*V* NaCl solution, 100 mL of solution contains 40 g of NaCl.
Given density (specific gravity) = 1.12 g mL^{-1}
100 mL solution (= 112 g) contains 40 g NaCl or 112 g of solution contains 40 g of NaCl.
10^6 g of solution contains x g of NaCl.

$$x = \frac{40}{112} \times 10^6 = 3.57 \times 10^5 \text{ ppm}$$

28.(D) From the reaction, we have

$$Z_2O_3 + 3H_2O \longrightarrow 2Z + 3H_2O$$

$$\text{mmol } H_2 = \frac{6}{2} = 3$$

Now, $3 \text{ mmol } H_2 \equiv 1 \text{ mmol } Z_2O_3 = \dfrac{0.16}{(2Z + 48)} \times 1000 \Rightarrow Z = 56 \text{ g}$

29.(B) $H_2C_2O_4 \longrightarrow HC_2O_4^- + H^+$ (*n*-factor = 1)

$$H_2C_2O_4 \longrightarrow C_2O_4^- + 2H^+ \qquad (n\text{-factor} = 2)$$

So, $$M_{H_2C_2O_4} = \frac{0.9/90}{100/1000} = 0.1\,\text{M}$$

or $$N_{HC_2O_4^-} = 1 \times 0.1\,\text{N} = 0.1\,\text{N} \quad \text{and} \quad N_{C_2O_4^{2-}} = 2 \times 0.1\,\text{N} = 0.2\,\text{N}$$

30.(B) $2P + 3Q \longrightarrow P_2Q_3$

$P + 2Q \longrightarrow PQ_2$

$$M_{P_2Q_3} = \frac{15.9}{0.15} = 2P + 3Q \text{ and } M_{PQ_2} = \frac{9.3}{1.15} = P + 2Q$$

Hence, atomic weight of P = 26 and Q = 18.

<H2> Multiple Correct Choice Type

1.(A, B)

(A) 20 g of NaOH in 200 mL of solution

$$M = \frac{\text{Weight required} \times 1000}{\text{Molecular weight} \times \text{Volume required}} = \frac{20 \times 1000}{40 \times 200}\,\text{M} = 2.5\,\text{M}$$

(B) 0.5 mol of KCl in 200 mL of solution

$$M = \frac{\text{Number of moles}}{\text{Liters of solution}} = \frac{0.5}{0.2\,\text{L}} = 2.5\,\text{M}$$

(C) 40 g of NaOH in 100 mL of solution

$$M = \frac{\text{Weight required} \times 1000}{\text{Molecular weight} \times \text{Volume required}} = \frac{40 \times 1000}{40 \times 100} = 10\,\text{M}$$

(D) 20 g KOH in 200 mL of solution

Molecular weight of KOH = 56 g

$$M = \frac{20 \times 1000}{56 \times 200} = 1.785\,\text{M}$$

Hence, options (A) and (B) are the same concentration.

2.(B, D) From the stoichiometry of the reaction, we have

$$Fe_{0.95}O + O_2 \rightarrow Fe_2O_3$$

Let x be the fraction of Fe^{3+} in the compound; then $Fe^{2+} = (0.95 - x)$

$$3x + (0.95 - x)2 - 2 = 0 \Rightarrow x = 0.1$$

Then moles of Fe^{2+} = 0.85 mol

So, percentage composition of Fe^{3+} = 10% and of Fe^{2+} is 90%.

3.(A, B) Molarity and normality are dependent on temperature, since molarity and normality involves the use of volume of solution. Molality and mole fraction do not depend on temperature, since, they are mass dependent quantities.

4.(A, D) $2\,PF_3(g) + XeF_4(s) \rightarrow 2\,PF_5(g) + Xe(g)$

$$100.0\text{ g } PF_3 \times \frac{1\text{ mol } PF_3}{87.968\text{ g}} \times \frac{2\text{ mol } PF_5}{2\text{ mol } PF_3} = 1.137\text{ mol } PF_5$$

$$50.0\text{ g } XeF_4 \times \frac{1\text{ mol } XeF_4}{207.28\text{ g}} \times \frac{2\text{ mol } PF_5}{1\text{ mol } XeF_4} = 0.482\text{ mol } PF_5$$

XeF_4 produces fewer moles of PF_5; therefore, it is the limiting reagent and 0.482 mol of PF_5 would be produced.

5.(A, C) The reaction involved is

$$\underset{\substack{48\text{ g}\\1\text{ g}}}{2Mg} + \underset{\substack{32\text{ g}\\2\text{ g}}}{O_2} \longrightarrow \underset{80\text{ g}}{2MgO}$$

Amount of O_2 utilized for the reaction is $\frac{32\text{ g }O_2}{48\text{ g Mg}}\times 1\text{ g Mg} = 0.67\text{ g}$

$$\frac{80\text{ g MgO}}{48\text{ g Mg}}\times 1\text{ g} = 1.67\text{ g of MgO}$$

At the end, 1.67 g of MgO + 1.33 g of O_2 (unreacted) + 0.33 g Mg
Hence, the total weight = 3 g
So, the incorrect answers are (A) and (C).

<H2> Assertion–Reasoning

1.(B) Under similar conditions,

$$\text{Vapor density} = \frac{\text{Mass of } V \text{ liter of gas}}{\text{Mass of } V \text{ liter of hydrogen}}$$

2.(B) Molality does not depend on volume; thus, it does not depend on temperature, as it does not involve volume term.

3.(A) The reactions involved are

$$\overset{-1}{S_2} \rightarrow \overset{+4}{S}O_2 + 10e^-$$

$$Fe^{2+} \rightarrow Fe^{3+} + 1e^-$$

$$\overset{2+\ 1-}{FeS_2} \xrightarrow{O_2} \overset{3+}{Fe_2}O_3 + \overset{4+}{S}O_2$$

4.(B) We know

$$\text{Equivalent weight} = \frac{\text{Molecular weight}}{\text{Valence factor}}$$

Statement 2 is correct, but not correct explanation for statement 1.

5.(A) $\text{Number of gram equivalent} = \frac{\text{Mass in grams}}{\text{Gram-equivalent mass}} = \frac{W(\text{g})}{\text{Gram-equivalent mass}}$

6.(B) Urea is H_2NCONH_2

$$\%\text{ of N} = \frac{28}{60}\times 100 = 46.6\%$$

Urea is a covalent compound.

7.(B) $\text{Milliequivalent} = N \times V\ (\text{mL}) = \frac{\text{Weight}}{\text{Equivalent weight}} \times 1000$.

No doubt N decreases with dilution but V increases; thus, milliequivalents of the solute remain constant and millimoles too remain constant.

8.(A) 6.023×10^{23} molecules = 1 mol

So, $$1\text{ molecule} = \frac{1}{6.023\times 10^{23}}$$

1 mol of H_2O = 18 g

So, $$\frac{1}{6.023\times 10^{23}}\text{ mol} = \frac{18}{6.023\times 10^{23}}\text{ g} = \frac{18\times 10^{-3}}{6.023\times 10^{23}}\text{ kg}$$

Now, Density = Mass/Volume. So,

$$\text{Volume} = \frac{\text{Mass}}{\text{Density}} = \frac{\frac{18\times10^{-3}}{6.023\times10^{23}}}{1\times10^{3}} = 2.99\times10^{-23}\ \text{mL}$$

9.(A) Both 106 g of Na_2CO_3 and 12 g of carbon have 1 mol of carbon atom, therefore, the number of carbon atom in 1 g of carbon is 6.023×10^{23} carbon atoms.

10.(B) One mole of water molecules contains = $18 \times 6.023 \times 10^{23}$ g atoms.

<H2> Comprehension Type

Paragraph I

1.**(C)**

Therefore, 109% labeled oleum will contain 9 g H_2O, 40g free SO_3, 60 g H_2SO_4; as 109% means diluting 100 g of oleum gives 109 g of H_2SO_4.

40 g (free) SO_3 = Moles of SO_3 (free) = 0.5 = y

60 g (H_2SO_4) = 0.6122 mol H_2SO_4 = x

Therefore, $x^2 + y^2 = 0.25 + 0.37 = 0.62$

2.(C) 98 g H_2SO_4 contains 80 g SO_3

60 g H_2SO_4 contains $= \frac{80\times60}{98} = 48.98$ g

% of combined SO_3 in oleum = 48.98%

3.(D) In 100 g oleum sample,

$$SO_3 + \underset{0.5\ \text{mol}}{H_2O} \rightarrow H_2SO_4$$

Therefore, SO_3 = 0.5 mol = 40 g

Weight of SO_3 = 40 g

Weight of H_2SO_4 = 60 g

% of SO_3 = 40%

% of H_2SO_4 = 60%

4.(B) As milliequivalent of NaOH = Milliequivalent of SO_3 + Milliequivalent of H_2SO_4

Therefore, $$1\times1\times V = \frac{40}{80}\times2 + \frac{60}{98}\times2 \Rightarrow V = 2.224\ \text{L}$$

Paragraph II

5.(B) 1 mol of alkali metal carbonate would require 2 mol of HCl. As

$$M_2CO_3 + 2HCl \rightarrow MCl_2 + H_2O + CO_2$$

Hence, number of equivalents of each metal carbonates = 0.0111

So, Number of moles of metal carbonates = 0.0055

as n-factor = 2.

Hence, number of equivalents of HCl required to neutralize metal carbonates = 0.0222

Since alkali metal carbonates are equimolar, the number of equivalents of HCl required to neutralize each metal carbonates = 0.0222/2 = 0.0111.

6.(D) Number of equivalents of acid is equal to $N\times V(\text{L}) = 0.5\times\frac{44.4}{1000} = 0.0222$

<H2> Integer Answer Type

1.(2,6) The number of moles of H_3PO_4 in 196 g $(n) = \frac{196}{98} = 2$

$\text{Equivalents} = \text{Moles} \times n\text{-Factor} = 2 \times 3 = 6$

2.(1.5×10^{23}**)** The number of moles $(n) = \frac{16}{64} = 0.25$

Therefore, $N = 0.25 \times 6.02 \times 10^{23} = 1.5 \times 10^{23}$

3.(1) $n = \frac{w}{\text{Molecular weight}} = \frac{24\text{ g}}{24\text{ g/mol}} = 1\text{ mol}$

4.(2) Given that 2.48 g residue is of Ag

$$Ag_2CO_3 \xrightarrow{\Delta} 2Ag \uparrow + CO_2 \uparrow + O_2 \uparrow$$

$$n_{Ag_2CO_3} = \frac{2.48}{276} = 0.009$$

Therefore, nAg = 0.018

or $w_{Ag} = 0.018 \times 108 = 1.944 \approx 2$ g

5.(7) Atomicity of an elementary substance is defined as the number of atoms in a molecule of the element. In H_2SO_4, there are 7 atoms: 2 × H + 1 × S + 4 × O = 7 atoms. Hence, atomicity is 7.

6.(100%) From the stoichiometry of the reaction, we have

$$\underset{1\text{ mol}}{Ca(HCO_3)_2} \xrightarrow{1\text{ mol}} CaCO_3 + H_2O + \underset{1\text{ mol}}{CO_2} \uparrow$$

Hence, the yield is 100%

7.(42) We know

$$N = \frac{m}{\text{Eq. wt}} \times \frac{1000}{V(\text{mL})}$$

Substituting the values in Eq. (1), we get

$$\frac{1}{2} = \frac{0.84}{\text{Eq. wt}} \times \frac{1000}{40}$$

$$\Rightarrow \quad \text{Eq. wt} = \frac{2 \times 84}{4} = 42$$

8.(45 mL) For the given reaction,

$$BaCl_2 + K_2SO_4 \rightarrow BaSO_4 \downarrow + 2KCl$$

From stoichiometry of the reaction, we have

$$n_{K_2SO_4} = n_{BaSO_4}$$

Moles of $BaSO_4$ precipitated $= \frac{1.2}{233} = 0.005\text{ mol}$

Therefore, moles of K_2SO_4 produced = 0.005 mol

Amount of K_2SO_4 produced = 0.005×174 = 0.896 g

From the given information,

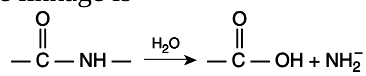
5 g of K_2SO_4 dissolved in 250 mL of solution.

$\Rightarrow$ 1 g of K_2SO_4 dissolved in 50 mL of solution.
Hence, the volume used for 0.896 g of $K_2SO_4 = 0.896 \times 50 = 44.8 \approx 45$ mL

9.(1) By equating equivalents, we get

$$\frac{4.48}{22.4} \times 1000 = 100 \times M \times 2 \Rightarrow M = 1\text{ M}$$

10.(6) The hydrolysis reaction of peptide linkage is



Let *n* glycine units be present in the compound, then the total weight of the product will be
796 + 9 × 18 = 958 (since there are 9 water molecules)
Percent weight of glycine in the given weight of product

$$\frac{75n}{958} \times 100 = 47\%$$

Therefore,

$$n = 47 \times \frac{958}{75} \times 100 = 6$$

<H2> Matrix–Match Type

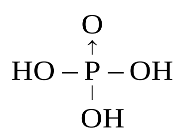
1. A → (p, q, r, s), B → (q, r), C → (q, r), D → (r, s)

Molality, mole fraction, and normality are independent of temperature because all these involve weight, which does not depend on temperature.
On diluting a solution, all concentrations change.
Molarity, molality, and mole fraction are dependent on pressure.
Volume affects the concentration of molarity and normality.

Solution

2. A → (r), B → (t), C → (p)

H_3PO_4 is tribasic acid (*n* = 3); H_3PO_3 is dibasic acid (*n* = 2); H_3BO_3 is monobasic acid (*n* = 1); and EDTA is tetrabasic acid (*n* = 4).



3. A → (q, t), B → (p), C → (r), D → (s)

(p) 4480 mL of CO_2 at STP

$$\frac{1\text{ mol}}{22400\text{ mL}} \times 4480\text{ mL} = 0.2\text{ mol}$$

(q) 0.1 g atom of iron = 0.1 mol
(r) 1.5×10^{23} molecules of oxygen gas

$$\frac{1\text{ mol}}{6 \times 10^{23}} \times 1.5 \times 10^{23} = 0.25\text{ mol}$$

(s) 9 mL H_2O

$$\frac{1\text{ mol}}{18\text{ mL }H_2O} \times 9\text{ mL} = 0.5\text{ mol}$$

(t) 200 mg hydrogen gas

$$\frac{1\,\text{mol}}{2\,\text{g}} \times 0.2\,\text{g} = 0.1\,\text{mol}$$