kd 700+ neet ch-1 some basic concepts of chemistry

* SECTION - A [800]

1. 1 gram of sodium hydroxide was treated with 25 mL of $0.75 \mathrm{M HCl}$ solution, the mass of sodium hydroxide left unreacted is equal to

   (A) 250mg (B) 0 mg (C) 200mg (D) 750mg

Ans. : a

$$M=\frac{W \times 1000}{M_2 \times V(\text{ in } mL)}$$

$$\mathrm{W}=\frac{\mathrm{M} \times \mathrm{M}_2 \times \mathrm{V}(\text{ in mL})}{1000}=\frac{0.75 \times 36.5 \times 25}{1000}$$

$=0.684$ g (Mass of HCl)

$\mathrm{HCl}_{36.5\ \mathrm{g}}+\mathrm{NaOH}_{40\ \mathrm{g}} \longrightarrow \mathrm{HCl}+\mathrm{NaOH}$

36.5 gHCl reacts with NaOH = 40 g

0.684 gHCl reacts with NaOH $=\frac{40}{36.5} \times 0.684=0.750$ g

Amount of NaOH left $=1\ \mathrm{g}-0.750\ \mathrm{g}=0.250\ \mathrm{g}=250 \mathrm{mg}$

2. A compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is :
   (Given atomic masses of $A=64$; $B=40$; $C=32u$)

   (A) ABC_3 (B) AB_2C_2 (C) ABC_4 (D) A_2BC_2

Ans. : a

Element	Mass percentage	No. of moles	No. of moles/ Smallest number	Simplest whole number
A	32	$\frac{32}{64}=\frac{1}{2}$	$\frac{1}{2} \times 2$	$=1$
B	20	$\frac{20}{40}=\frac{1}{2}$	$\frac{1}{2} \times 2$	$=1$
C	48	$\frac{48}{32}=\frac{3}{2}$	$\frac{3}{2} \times 2$	$=3$

So, empirical formula $*=A=1: B=1: C=3$

$\therefore$ The correct empirical formula of compound X is ABC_3

3. The highest number of helium atoms is in

   (A) 4 u of helium (B) 4 g of helium
   (C) 2.271098 L of helium at STP (D) 4 mol of helium

Ans. : d

(1) $4u$ of He $=\frac{4u}{4u}=1$He atom

(2) 4 g of Helium $=\frac{4\ \mathrm{g}}{4\ \mathrm{g}}$ mole $=1$ mole $=\mathrm{NA}_{\mathrm{Ae}}$ atom

(3) 2.2710982 of He at STP $= \frac{2.271}{22.710982}$ mole
$= 0.1$ mole
$= 0.1\ N_A$He atom
(4) 4 mol of He = 4 NNe atoms

4. The right option for the mass of CO_2 produced by heating $20g$ of 20% pure limestone is .... g(Atomic mass of $Ca = 40$)$[CaCO_3 \xrightarrow{1200K} CaO + CO_2]$

(A) 1.32 (B) 1.12 (C) 1.76 (D) 2.64

Ans. : c

Weight of impure limestone $= 20\,g$

Weight of pure limestone $(CaCO_3) = 20\%$ of $20\,g$

$= \frac{20}{100} \times 20$
$= 4\,g$

$n_{CaCO_3} = \frac{4}{100} = 0.04$
$CaCO_3 \rightarrow CaO + CO_2$
$n = 0.04 \quad n = 0.04$
$n_{CO_2} = 0.04$
$W_{CO_2} = 0.04 \times 44$
$= 1.76\,g$

5. In one molal solution that contains 0.5 mole of a solute, there is

(A) $500\,g$ of solvent (B) $100\,mL$ of solvent (C) $1000\,g$ of solvent (D) $500\,mL$ of solvent

Ans. : a

$m = \frac{\text{Moles of solute}}{\text{Weight of solvent }(g)} \times 1000$
$1 = \frac{0.5}{\text{Weight of solvent }(g)} \times 1000$
Weight of solvent (g) = $500\,g$

6. What mass of 95% pure $CaCO_3$ will be required to neutralise $50\,mL$ of $0.5\,M\,HCl$ solution according to the following reaction? (In g)
$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$
[Calculate upto second place of decimal point]

(A) 1.32 (B) 3.65 (C) 9.50 (D) 1.25

Ans. : a

$CaCO_{3(s)} + 2HCl_{(\text{aq}))} \rightarrow CaCl_{2(aq)} + CO_{2(q)} + H_2O_{(q)}$

no. of moles of $CaCO_3$ (pure) $= \frac{1}{2} \times$ mole of HCl

[Mole = molarity × volume(in ltr.)]

$= \frac{1}{2} \times 0.5 \times \frac{50}{1000} = 0.0125$

weight of $CaCO_3$ (pure) $=$ mole $\times$ mol. wt

$= 0.0125 \times 100 = 1.25\,g$

% purity $= \frac{\text{wt. of pure substance}}{\text{wt. of impure sample}} \times 100$

$95 = \frac{1.25}{\text{wt. of impure sample}} \times 100$

wt. of impure sample $= \frac{1.25 \times 100}{95} = 1.32\,g$

7. An organic compound contains 78 % (by $wt.$) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]

(A) CH (B) CH_2
(C) CH_3 (D) CH_4

Ans. : c

$C \quad 78 \quad \frac{78}{12} = 6.5 \quad \frac{6.5}{6.5} = 1$

$H \quad 22 \quad \frac{22}{1} = 22 \quad \frac{22}{6.5} = 3.38 = 3$

Emperical formula $= CH_3$

8. Which one of the following has maximum number of atoms?

(A) $1g$ of $Li(s)$ [Atomic mass of $Li = 7$]

(B) $1g$ of $Ag(s)$ [Atomic mass of $Ag = 108$]

(C) $1g$ of $Mg(s)$ [Atomic mass of $Mg = 24$]

(D) $1g$ of $O_2(g)$ [Atomic mass of $O = 16$]

Ans. : a

Number of atoms

$= \frac{w}{\text{molar mass}} \times N_A \times$ atomicity

(1) $\frac{1}{7} \times N_A \times 1$

(2) $\frac{1}{108} \times N_A \times 1$

(3) $\frac{1}{24} \times N_A \times 1$

(4) $\frac{1}{32} \times N_A \times 2$

9. The density of 2 M aqueous solution of NaOH is $1.28\ g/cm^3$. The molality of the solution is.....m [Given that molecular mass of NaOH = $40\ gmol^{-1}$]

(A) 1.20 (B) 1.56 (C) 1.67 (D) 1.32

Ans. : c

2M solution of NaOH means 2 mole NaOH is present in 1L solution; density $= 1.28 g/ml$

mass of solution = volume of solution × density $= 1000 \times 1.28$
$= 1280\text{g}$
mass of solvent = mass of solution − mass of solute $= 1280 - 80$
$= 1200\text{g}$

molality $= \frac{2}{1200} \times 1000 = \frac{20}{12} = \frac{10}{6} = \frac{5}{3} = 1.67\text{m}$

10. A mixture of 2.3 g formic acid and 4.5 g oxallic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight of the remaining product at STP ....g

(A) 1.4 (B) 3 (C) 2.8 (D) 4.4

Ans. : c

$$\mathrm{HCOOH} \xrightarrow[dehydratingAgent]{H_2SO_4} \mathrm{CO} + \mathrm{H_2O}\left(\begin{array}{l}\mathrm{H_2O\ abosrbed}\\ \mathrm{by H_2SO_4}\end{array}\right)$$

$(\text{moles})_1 = \frac{2.3}{46} = \frac{1}{20} \quad 0 \quad 0$

$(\text{moles})_f 0 \quad \frac{1}{20} \quad \frac{1}{20}$

$$\mathrm{H_2C_2O_4} \xrightarrow{\mathrm{H_2SO_4}} \mathrm{CO} + \mathrm{CO_2} + \mathrm{H_2O}$$

$\left[\mathrm{H_2O\ absorbed\ by\ H_2SO_4}\right]$

$(\text{moles})_1 \quad \frac{4.5}{90} = \frac{1}{20} 0 \quad 0 \quad 0$

$(\text{moles})_f \quad 0 \quad \frac{1}{20} \quad \frac{1}{20} \quad \frac{1}{20}$

CO_2 is absorbed by KOH. So the remaning product is only CO. moles of CO formed from both reactions

$= \frac{1}{20} + \frac{1}{20} = \frac{1}{10}$

Left mass of CO = moles × molar mass

$= \frac{1}{10} \times 28$

$= 2.8\text{g}$

11. A hydrocarbon contains $85.7\,\%C$. If $42\,mg$ of the compound contains 3.01×10^{20} molecules, the molecular formula of the compound will be

(A) C_3H_6 (B) C_6H_{12} (C) $C_{12}H_{24}$ (D) C_2H_4

Ans. : b

85.7% carbon $\Rightarrow 100 - 85.7 = 14.3\%$ Hydrogen gram molecular weight $= 6.023 \times 10^{23}$

$\Rightarrow 42mg = 3.018 \times 10^{20}$

$\Rightarrow 84mg = 6.02 \times 10^{20}$

$84g = 6.02 \times 10^{23}$

$\therefore 85.7\% = \frac{85.7}{100} \times 84 = 72g$

$1 mole$ of $C = 12g$

6 moles of $C = 12 \times 6 = 72g$

$\therefore$ There are 6 carbons in each molecule

$84 - 72 = 12g$ of $H = 12H$ atoms in each molecule

$\therefore$ Molecular formula $= C_6H_{12}$

12. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are

(A) 40, 30 (B) 60, 40 (C) 20, 30 (D) 30, 20

Ans. : a

For XY_2

$\because 0.1\text{mole}$

$XY_2 \equiv 10g \therefore 1\text{mole}$

$XY_2 \equiv 100g = X + 2Y = 100 \ldots (1)$

For X_3Y_2

$\because$ 0.05 mole

X_3Y_2

$\because 9g$

$\therefore$ 1 mole $X_3Y_2 \equiv 180g$

$3X + 2Y = 180 \ldots (2)$

On solving (1) and (2), $X = 40$ And $Y = 30$

13. What is the mass of the precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 5.8% $NaCl$ solution ? .... g ($Ag = 107.8$, $N = 14$, $O = 16$, $Na = 23$, $Cl = 35.5$)

(A) 3.5 (B) 7 (C) 14 (D) 28

Ans. : b

Moles of $AgNO_3 = 50 \times 16.9/100 \times 169.8$

$= 0.05\text{mole}$

Moles of $\text{NaCl} = 50 \times 5.8/100 \times 58.5$

$= 0.05\text{mole}$

$\text{AgNO3} + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO3}$

mass of AgCl = mole × molar mass

$= 0.05 \times 143.5$

$= 7.16\text{g}$

14. If Avogadro number N_A, is changed from $6.022 \times 10^{23}\ mol^{-1}$ to $6.022 \times 10^{20}\ mol^{-1}$, this would change

(A) the mass of one mole of carbon

(B) the ratio of chemical species to each other in a balanced equation

(C) the ratio of elements to each other in a compound

(D) the definition of mass in units of grams.

Ans. : a

mass of $1\text{mol}\,(6.022 \times 10^{23}$ atoms) of carbon $= 12\text{g}$

If Avogadro Number (NA) is changed than mass of $1 mol\,(6.022 \times 10^{20}$ atom) of carbon. $= \frac{12 \times 6.022 \times 10^{20}}{6.022 \times 10^{23}} = 12 \times 10^{-3} g$

Therefore the mass of 1 mol of carbon is changed

15. A mixture of gases contains H_2 and O_2 gases in the ratio of $1:4$ (w/w). What is the molar ratio of the two gases in the mixture?

(A) $16:1$ (B) $2:1$ (C) $1:4$ (D) $4:1$

Ans. : d

Let the mass of $\mathrm{H_2}$ gas be xg and mass of $\mathrm{O_2}$ gas 4xg Molar

$\mathrm{H_2} : \mathrm{O_2}$

mass $2:32$

i.e. $1:16$

therefore, Molar ratio $= \frac{n_{\mathrm{H}_{12}}}{n_{0_2}} = \frac{x/2}{4x/32} = \frac{(x) \times 32}{2 \times 4x} = \frac{4}{1} = 4:1$

16. $1.0\ g$ of magnesium is burnt with $0.56\ g\ O_2$ in a closed vessel. Which reactant is left in excessand how much? (At. $wt.$ $Mg = 24$, $O = 16$)

(A) $Mg,\ 0.16\ g$ (B) $O_2,\ 0.16\ g$

(C) $Mg,\ 0.44\ g$ (D) $O_2,\ 0.28\ g$

Ans. : a

The balanced chemical reaction is shown below:

$Mg + \frac{1}{2} O_2 \rightarrow MgO$

Moles: $\frac{1.0}{24}; \frac{0.56}{32}$

$\frac{0.5}{12}; \frac{0.07}{4}$

$\frac{0.5}{12} - x; \frac{0.07}{4} - \frac{x}{2}$

Oxygen is limiting reagent so, $\frac{0.07}{4} - \frac{x}{2} = 0$

$x = \frac{0.07}{2}$

Excess $Mg = \frac{0.5}{12} - \frac{0.07}{2}\ \text{mol}$

Mass of Mg is $= 1 - 0.7 \times 12 = 0.16\ \text{g}$

Thus, when $1.0\ g$ of magnesium is burnt with $0.56\ \text{g}O_2$ in a closed vessel, $0.16\ \text{g}$ magnesium is left in excess.

17. When 22.4 litres of $H_{2(g)}$ is mixed with 11.2 litres of $Cl_{2(g)}$, each at $S.T.P$, the moles of $HCl_{(g)}$ formed is equal to

(A) 1 mol of $HCl_{(g)}$
(B) 2 mol of $HCl_{(g)}$
(C) 0.5 mol of $HCl_{(g)}$
(D) 1.5 mol of $HCl_{(g)}$

Ans. : a

The given problem is related to the concept of stoichiometry of chemical equations. Thus, we have to convert the given volumes into their moles and then, identify the limiting reagent [possessing minimum number of moles and gets completely used up in the reaction]. The limiting reagent gives the moles of product formed in the reaction.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

Initial vol. $22.4L$ $11.2L$ $2mol$

$\therefore$ 22.4L volume at STP is occupied by

$Cl_2 = 1$ mole

$\therefore$ 11.2L volume will be occupied by

$Cl_2 = \frac{1 \times 11.2}{22.4}\text{mol} = 0.5\text{mol}$

22.4L volume at STP is occupied by $H_2 = 1\text{mol}$

Thus, $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

1mol 1mol 0.5mol

since, Cl_2 possesses minimum number of moles,

thus it is the limiting reagent.

As per equation,

1 $mole$ of $Cl_2 = 2$ moles of HCl

$\therefore$ 0.5 mole of $Cl_2 = 2 \times 0.5$ mole of HCl

$= 1.0$ mole of HCl

Hence, 1.0 $mole$ of HCl(g) is produced by 0.5 $mole$ of Cl_2[or 11.2L]

18. In an experiment it showed that 10 mL of 0.05 M solution of chloride required 10 mL of 0.1 M solution of $AgNO_3$, which of the following will be the formula of the chloride (X stands for the symbol of the element other than chlorine)

(A) X_2Cl_2
(B) XCl_2
(C) XCl_4
(D) X_2Cl

Ans. : b

Stoichiometry deals with measurements of reactants and products in a chemical reaction.

$aA(g) + bB(g) \rightarrow cC(g) + dD(g)$

Here, 'a' moles of $A(g)$ reacts with 'b' moles of $B(g)$ to give 'c' mole of $C(g)$ and 'd' moles of $D(g)$

No. of moles of $\text{AgNO}_3 = 10^{-3}\text{mol}$

No. of moles the chloride $= 0.5 \times 10^{-3}\text{mol}$

Suppose the formula for the chloride is $\mathrm{XCl_n}$ then moles of chloride ion $= \mathrm{n} \times 0.5 \times 10^{-3}$

Reaction goes as follows:

$Ag^{+} + Cl^{-} \rightarrow AgCl$

Then, going by stoichiometry we get

$n \times 0.5 \times 10^{-3} = 10^{-3}$

$\Rightarrow n = 2$

Therefore, formula is $\mathrm{XCl_2}$

19. 6.02×10^{20} molecules of urea are present in $100\ mL$ of its solution. The concentration of solution is.....M

(A) 0.001 (B) 0.1 (C) 0.02 (D) 0.01

Ans. : d

Number of moles $= \frac{\text{number of molocules}}{\mathrm{NA}} = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 10^{-3}\mathrm{mol}$

Molar conc $= \frac{n \times 1000}{V_{\text{solution (mL)}}} = \frac{10^{-3} \times 1000}{100}$

Molar conc. $= 0.01\mathrm{M}$

20. The normality of 4% (w/V) $NaOH$ is

(A) 0.1 (B) 1 (C) 0.05 (D) 0.01

Ans. : b

$N = \frac{4 \times 1000}{40 \times 100} = 1.0$

21. How much volume of $5\,M\ HNO_3$ is required to oxidise $16\,g\ Fe^{+2}$ if HNO_3 is converting into NO .... ml

(A) 16 (B) 19.05 (C) 38.1 (D) 32

Ans. : b

$5 \times 3 \times V = \frac{16}{56} \times 1 \times 1000$

$V = 19.05\,mL$

22. The number of ions present in $2\,L$ of a solution of $1.6\,M\,K_4[Fe(CN)_6]$ is

(A) 4.8×10^{22} (B) 4.8×10^{23}

(C) 9.6×10^{24} (D) 9.6×10^{22}

Ans. : c

No. of molecules of $\mathrm{K_4\left[Fe(CN)_6\right]}$

$= 1.6 \times 2 \times 6 \times 10^{23}$

No. of ions $= 5 \times 1.6 \times 2 \times 6 \times 10^{23}$

$= 9.6 \times 10^{24}$

23. An aqueous solution of glucose is 10% in strength. The volume in which $1\, g-mole$ of it is dissolved will be L

(A) 18 (B) 9 (C) 0.9 (D) 1.8

Ans. : d

$10\,\mathrm{g}$ glucose $\rightarrow 100\,\mathrm{ml}$

$180\,\mathrm{g}$ glucose $\rightarrow \frac{100}{10} \times 180 = 1800\,\mathrm{mL} = 1.8\,\mathrm{L}$

24. The molality of $1\, M$ solution of $NaCl$ (specific gravity $1.0585\, g/ml$) is

(A) 1.0585 (B) 1 (C) 0.10 (D) 0.0585

Ans. : b

$\mathrm{m} = \frac{\text{mole of NaCl}}{\text{Weight of solvent in kg.}} = \frac{1}{1} = 1$

weight of solvent = weight of solution − weight of NaCl

$= 1.0585 \times 1000 - 58.5$

$= 1058.5 - 58.5 = 1000\, g = 1\,\mathrm{kg}$

25. How much volume of water is to be added to dilute $10\, ml$ of $10\, N\, HCl$ to make it decinormal? .... ml

(A) 990 (B) 1010 (C) 100 (D) 1000

Ans. : a

$\mathrm{M_{eq}}$ of conc. HCl = $\mathrm{M_{\infty}}$ of dil. HCl

$10 \times 10 = V \times \frac{1}{10}$

$V = 1000\,\mathrm{ml}$

Thus, $990\,\mathrm{ml}$ of water should be added to $10\,\mathrm{ml}$ of conc. HCl to get decinormal solution.

26. Which is the correct option for $0.1\, M,\ 500\, ml$ of $AgCl$?

(A) $0.05\, mole$ of $AgCl$ (B) $0.1\, mole$ of total ions

(C) $0.05\, N_A$ number of Cl^- ions (D) All of the above

Ans. : d

$\mathrm{n_{AgCl}} = \mathrm{M} \times \mathrm{V}(\text{ litre })$

$\mathrm{n_{AgCl}} = \mathrm{M} \times \mathrm{V}(\text{ litre })$

	$AgCl \rightarrow$	Ag^+ +	Cl^-
moles	0.05	0	0
mole	−	0.05	0.05

$\mathrm{n_{Total\ ions}} = 0.05 + 0.05 = 0.1$

number of Cl^- ion $= 0.05 \times N_A$

27. $1\, gram$ equivalent of substance present in

(A) $1\, L$ of $0.5\, M\, H_2SO_4$ (B) $49\, gm$ of H_2SO_4

(C) $0.5\, mol$ of $H_2\, gas$ (D) All of the above

Ans. : (D) All of the above

28. Volume of 0.6 $M\ NaOH$ required to neutralize 30 cm^3 of 0.4 $M\ HCl$ is .... cm^3

(A) 30 (B) 20 (C) 50 (D) 45

Ans. : b

(b) $NaOH\ HCl$

$N_1V_1 = N_2V_2$; $0.6 \times V_1 = 0.4 \times 30$; $V_1 = 20\,ml$.

29. The solution of sulphuric acid contains 80% by weight H_2SO_4. Specific gravity of this solution is 1.71. Its normality is about

(A) 18 (B) 27.9 (C) 1 (D) 10

Ans. : b

(b)$N = \frac{10 \times \mathrm{sp.gr.ofthesolution} \times \mathrm{wt.\%ofsolute} \times \mathrm{Mol.wt.}}{\mathrm{Molecularwt.ofsolute} \times \mathrm{Eq.wt.}}$

$N = \frac{10 \times 1.71 \times 80 \times 98}{98 \times 49} = 27.9$

30. 1.25 g of a solid dibasic acid is completely neutralised by 25 ml of 0.25 molar $Ba(OH)_2$ solution. Molecular mass of the acid is

(A) 100 (B) 150 (C) 120 (D) 200

Ans. : d

(d) Molarity $= \frac{W(gm) \times 1000}{V(ml) \times \mathrm{molecularweight}}$

$0.25 = \frac{1.25 \times 1000}{25 \times \mathrm{molecularweight}}$

$\therefore$ Molecular weight $= \frac{1.25 \times 1000}{0.25 \times 25} = 200$.

31. What is the concentration of nitrate ions if equal volumes of 0.1 $M AgNO_3$ and 0.1 $M NaCl$ are mixed together.....M

(A) 0.1 (B) 0.2 (C) 0.05 (D) 0.25

Ans. : c

(c) 0.1 $M\ AgNO_3$ will react with 0.10 $M NaCl$ to form 0.1 $M NaNO_3$. But as the volume doubled, conc. of

$NO_3^- = \frac{0.1}{2} = 0.05\,M$.

32. The conversion of oxygen to ozone occurs to the extent of 15% only. The mass of ozone that can be prepared from 67.2 L of oxygen at 1 atm and 273 K will be .... gm

(A) 14.4 (B) 96

(C) 640 (D) 64

Ans. : a

Mole of $O_2 = \frac{67.2}{22.4} = 3\,\text{mole}$

$3O_2 \rightarrow 2O_3$

$\therefore$ Mole of Ozone formed $= \frac{2}{3} \times \frac{15}{100} \times 3$

$= 0.3\,\text{mole}$

$\therefore$ Mass of ozone formed $= 0.3 \times 48\,\text{g} = 14.4\,\text{g}$

33. At $400\,K$, $1\,mol$ of a hydrocarbon completely burned. It gives $132\,g$ of a gas along with $72\,g$ of water vapour then hydrocarbon may be

(A) CH_4 (B) C_3H_8 (C) C_2H_4 (D) C_4H_{10}

Ans. : b

$$\underset{\substack{1\,\text{mol}\\44\,g}}{C_3H_8(g)} + \underset{5\,\text{mol}}{5O_2(g)} \rightarrow \underset{\substack{3\\=132\,g}}{3CO_2(g)} + \underset{\substack{4\\=72\,g}}{4H_2O(g)}$$

34. Consider the following data

Element	Atomic mass
A	12.01
B	35.5

A and B combine to form new substance X. If $4\,moles$ of B combine with $1\,mole$ of A to give $1\,mole$ of X, then weight of one mole of X is ……….. g

(A) 154 (B) 74 (C) 47.5 (D) 166

Ans. : a

$4B + A \rightarrow X$

X is AB_4

weight of 1 mol of X is weight of 1 mol of AB_4

weight of 1mol of $AB_4 = 1 \times 12.01 + 4(35.5)$

$= 154\text{g}$

weight of 1 mol $X = 154\text{g}$

35. For the reaction $2Al + 3MnO \xrightarrow{\Delta} Al_2O_3 + Mn$; If $108\,g$ of Al and $213\,g$ of MnO are heated then which of the following is incorrect?

(A) Al is present in excess

(B) MnO is present as limiting reagent

(C) $54\,g$ of Al is required

(D) $159\,g$ of MnO is required

Ans. : d

$$\underset{\substack{108\,g\\4\,mol}}{2Al} + \underset{\substack{213\,g\\3\,mol}}{3MnO} \xrightarrow{\Delta} Al_2O_3 + 3Mn$$

$(L. R.)$

36. In the complete combustion of C_4H_{10} the number of oxygen moles required is

(A) $\frac{17}{2}O_2$ (B) $6O_2$ (C) $\frac{13}{2}O_2$ (D) $\frac{5}{2}O_2$

Ans. : c

$C_nH_{2n+2} + \left(\frac{3n+1}{2}\right)O_2 \rightarrow nCO_2 + (n+1)H_2O$

37. The mass of N_2F_4 produced by the reaction of $2.0\ mole$ of NH_3 and $8.0\ mole$ of F_2 is $0.5\ mole$. What is the per cent yield ?

$2NH_3 + 5F_2 \rightarrow N_2F_4 + 6HF$

(A) 79.0 (B) 71.2 (C) 84.6 (D) 50

Ans. : (D) 50

38. Which statement is false for the balanced equation given below ?

$CS_2 + 3O_2 \rightarrow 2SO_2 + CO_2$

(A) One mole of CS_2 will produce one mole of CO_2

(B) The reaction of $16\,g$ of oxygen produces $7.33\,g$ of CO_2

(C) The reaction of one mole of O_2 will produce $2/3\ mole$ of SO_2

(D) Six molecules of oxygen requires three molecules of CS_2

Ans. : (D) Six molecules of oxygen requires three molecules of CS_2

39. $3O_2 + 2N_2 \rightarrow 2N_2O_3$

$9\,mol\ O_2$ and $14\,mol\ N_2$ here allowed to react. When $3\,mol\ O_2$ remains unreacted, till then how many moles of N_2O_3 would have been produced?

(A) 6 (B) 3 (C) 4 (D) 12

Ans. : c

reaction between oxygen and nitrogen is given by,

$2N_2 + 3O_2 \rightarrow 2N_2O_3$

here we see that 2 moles of $\mathrm{N_2}$ combine with 3 moles of oxygen and give 2 moles of $\mathrm{N_2O_3}$

a/c to question,

9 mol of O_2 and 14 mol of $n2$ here allowed to react.

when $3\mathrm{mol}$ of O_2 remain unreacted till then we have to find moles of N_2O_3 is formed.

at initial time, mole of $\mathrm{N_2O_3} = 0$

mole of $\mathrm{O_2} = 9$

mole of $\mathrm{N_2} = 14$

after some time,

mole of $\mathrm{O_2} = 9 - 3x$

mole of $N_2 = 14 - 2x$
mole of $N_2O_3 = 2x$
a/c to question, $9 - 3x = 3$
or, $x = 2$
then, number of mole of N_2O_3 is formed $= 2 \times 2 = 4\text{mol}$.

40. In the reaction $H_2 + O_2 \rightarrow H_2O$. If $6\,g$ of H_2 combines with $64\,g$ of O_2. Find mass of Excess reagent Left ? .... g

(A) 32 (B) 48 (C) 16 (D) None

Ans. : c

$$\underset{\substack{6\,g \\ (3\,mol) \\ [L \cdot R.]}}{2H_2} + \underset{\substack{64\,g \\ (2\,mol)}}{O_2} \rightarrow 2H_2O$$

$2\,\text{mol}\,H_2$ reacts with $O_2 = 1\,\text{mol}$

$\therefore\ 3\,\text{mol}\,H_2$ will react with $O_2 = \frac{1}{2} \times 3 = 1.5\,\text{mol}$

remaining amount of $O_2 = 0.5\,\text{mol} = 16\,\text{g}$

41. The mass of Mg_3N_2 produced if $48\,gm$ of Mg metal is reacted with $34\,gm\,NH_3$ gas is

$Mg + NH_3 \rightarrow Mg_3N_2 + H_2$

(A) $\frac{200}{3}\,gm$ (B) $\frac{100}{3}\,gm$ (C) $\frac{400}{3}\,gm$ (D) $\frac{150}{3}\,gm$

Ans. : a

$$\underset{\substack{3\,\text{mol} \\ (72\,g) \\ (L.R.)}}{3Mg} + \underset{\substack{2\,mol \\ (34\,g)}}{2NH_3} \rightarrow \underset{\substack{1\,mol \\ (100\,g)}}{Mg_3N_2} + 3H_2$$

$72\,g\,Mg$ will produce $Mg_3N_2 = 100\,\text{g}$

$48\,\text{g}\,\text{Mg}$ will produce $Mg_3N_2 = \frac{100}{72} \times 48$

$= \frac{200}{3}\,\text{g}$

42. Volume of air required to completely burn 10 litres of C_2H_4 is .... L (assume all volumes are measure at same temperature and pressure)

(A) 15 (B) 150 (C) 100 (D) 200

Ans. : b

$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

$1\,\text{L} \quad 3\,\text{L}$

$10\,\text{L} \quad 30\,\text{L}$

$V_{air} = \frac{30 \times 100}{20} = 150\,\text{L}$

43. When 22.4 *litres* of $H_2(g)$ is mixed with 11.2 *litres* of $Cl_2(g)$, each at $S.T.P.$, the moles of $HCl(g)$ formed is equal to

(A) 1 mol of $HCl(g)$ (B) 2 mol of $HCl(g)$ (C) 0.5 mol of $HCl(g)$ (D) 1.5 mol of $HCl(g)$

Ans. : a

$n_{H_2} = \frac{V(L)}{22.4L} = \frac{22.4}{22.4} = 1$

$n_{Cl_2} = \frac{11.2}{22.4} = 0.5\,\text{mole}$

$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$

initially 1 mol 0.5 mole 0

after reaction $(1-0.5)$ 0.5×2

$= 0.5$ mole 0 $= 1$ mole

44. Phosphine $[PH_3(g)]$ decomposes to produce vapours of phosphorus (P_4) and H_2 gas. What will be the change in volume when 100 mL of phosphine is decomposed ? .... mL

(A) $+50$ (B) 500 (C) $+75$ (D) -500

Ans. : c

$PH_3 \rightarrow \frac{1}{4}P_4 + \frac{3}{2}H_2$

$100\ ml$ $\frac{100}{4}\ ml$ $\frac{3}{2} \times 100\,ml$

$25\ ml$ $150\,ml$

change in vol. $= +75\,\text{mL}$

45. In alkaline condition $KMnO_4$, reacts as follows :

$2KMnO_4 + 2KOH \rightarrow 2K_2MnO_4 + H_2O + O$

Therefore its equivalent weight will be

(A) 31.5 (B) 52.7 (C) 72.0 (D) 158.0

Ans. : d

Equivalent mass of $KMnO_4 = \frac{\text{Molecular weight}}{\text{No. of electrons gained by } MnO_4}$

$MnO_4^- + e^- \rightarrow MnO_4^{2-}$

The number of electrons gained per molecule of $KMnO_4$ is 1.

So, the equivalent mass is 158.

46. In acidic medium potassium dichromate acts as an oxidant according to the equation, $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$. What is the equivalent weight of $K_2Cr_2O_7$? (mol. Wt. $= M$)

(A) M (B) $M/2$ (C) $M/3$ (D) $M/6$

Ans. : d

(d)Since it accept $6e^-$ its

Equivalent weight $= \frac{M}{6}$.

47. $56\,g$ of nitrogen and $8\,g$ hydrogen gas are heated in a closed vessel. At equilibrium $34\,g$ of ammonia are present. The equilibrium number of moles of nitrogen, hydrogen and ammonia are respectively

(A) $1, 2, 2$

(B) $2, 2, 1$

(C) $1, 1, 2$

(D) $2, 1, 2$

Ans. : c

(c) $N_2 + 3H_2 \rightleftharpoons 2NH_3$..... (i)

at $t = 0$ $\quad 56\,gm \quad 8\,gm \quad 0\,gm$

$= \ 2\,mole \quad 4\,mole \quad 0\,mole$

at equilibrium $\ 2-1 \quad 4-3 \quad 34\,gm$

$= \ 1\,mole \quad = \ 1\,mole \quad = \ 2\,mole$

According to eq. (i) 2 $mole$ of ammonia are present & to produce 2 $mole$ of NH_3, we need 1 mole of N_2 and 3 $mole$ of H_2 hence $2-1=1$ $mole$ of N_2 and $4-3=1$ mole of H_2 are present at equilibrium in vessel.

48. $100\,g\ CaCO_3$ reacts with 1 litre $1\,N\ HCl$. On completion of reaction how much weight of CO_2 will be obtain .... g

(A) 5.5 (B) 11 (C) 22 (D) 33

Ans. : c

(c) $\underset{100\,g}{CaCO_3} + \underset{2\,N}{2HCl} \rightarrow CaCl_2 + \underset{44\,g}{CO_2} + H_2O$

$100\,g\ CaCO_3$ with $2\,N\,HCl$ gives $44\,g\ CO_2$

$100\,g\ CaCO_3$ with $1\,N\,HCl$ gives $22\,g\ CO_2$

49. $Ca(OH)_2 + H_3PO_4 \rightarrow CaHPO_4 + 2H_2O$ the equivalent weight of H_3PO_4 in the above reaction is

(A) 21 (B) 27 (C) 38 (D) 49

Ans. : d

(d) The equivalent weight of $H_3PO_4 = \frac{\text{molecular weight}}{2}$

mole wt of $H_3PO_4 = 3 + 31 + 64 = 98$

$\frac{98}{2} = 49$

50. If $1\frac{1}{2}$ moles of oxygen combine with Al to form Al_2O_3 the weight of Al used in the reaction is .... g $(Al = 27)$

(A) 27 (B) 54 (C) 49.5 (D) 31

Ans. : b

(b) $2Al + \frac{3}{2}O_2 \rightarrow Al_2O_3$

According to equation $\frac{3}{2}$ mole of O_2 combines with 2 mole Al.

2 mole $Al = 54\,gm$

51. $2.76\,g$ of silver carbonate on being strongly heated yield a residue weighing .... g

(A) 2.16 (B) 2.48 (C) 2.64 (D) 2.32

Ans. : a

(a)

$2Ag_2CO_3 \xrightarrow{\Delta} 4Ag + 2CO_2 + O_2$

$2 \times 276\,gm$ of Ag_2CO_3 gives $4 \times 108\,gm$

$\therefore\ 1\,gm$ of Ag_2CO_3 gives $= \frac{4 \times 108}{2 \times 276}$

$\therefore\ 2.76\,gm$ of $2Ag_2CO_3$ gives $\frac{4 \times 108 \times 2.76}{2 \times 276} = 2.16\,gm$

52. In a compound C, H, N atoms are present in $9:1:3.5$ by weight. Molecular weight of compound is 108 . Its molecular formula is

(A) $C_2H_6N_2$ (B) C_3H_4N (C) $C_6H_8N_2$ (D) $C_9H_{12}N_3$

Ans. : c

$9 + 1 + 3.5 = 13.5$

13.5 g contains $\frac{9}{12}$ mole

108 g contains $\frac{9 \times 108}{12 \times 13.5} = 6$ mole carbon

i.e., $C_6H_8N_2$

53. In a compound the ratio of masses of H, C, O and N is $1:3:4:7$. The empirical formula is

(A) $HC_3O_4N_7$ (B) H_4CON_2 (C) $HC_4O_2N_2$ (D) None of these

Ans. : b

$H = 1/1 = 1 = 4 \quad \therefore H_4CON_2$

$C = 3/12 = \frac{1}{4} = 1$

$O = 4/16 = \frac{1}{4} = 1$

$N = 7/14 = \frac{1}{2} = 2$

54. Determine the empirical formula of Kelvar, used in making bullet proof vests, is 70.6% C, 4.2% H, 11.8% N and 13.4% O

(A) $C_7H_5NO_2$ (B) $C_7H_5N_2O$ (C) C_7H_9NO (D) C_7H_5NO

Ans. : d

Let the mass of compound be 100g

$C = 70.6g = \frac{70.6}{12}$ moles $= 5.88$ moles

$H = 4.2g = \frac{4.2}{1}$ moles $= 4.2$ moles

$N = 11.8g = \frac{11.8}{14}$ moles $= 0.84$ moles

$O = 13.4g = \frac{13.4}{16}$ moles $= 0.84$ moles

$C:H:N:O = 5.88:4.2:0.84:0.84$

$C:H:N:O = 7:5:1:1$

Therefore, empirical formula of Kelvar is C_7H_5NO

55. A compound contains 69.5% oxygen and 30.5% nitrogen and its molecular weight is 92 . The formula of that compound is

(A) N_2O (B) NO_2 (C) N_2O_4 (D) N_2O_5

Ans. : c

moles of oxygen $= 69.5/16$

$= 4.34$

moles of nitrogen $= 30.5/14$

$= 2.18$

ratio of moles of nitrogen and oxygen $= 2.18:4.34$

$= 1:2$

empirical formula $= NO_2$

molecular formula $= (\mathrm{NO_2})\mathrm{n}$

where $\mathrm{n} =$ molecular mass/ empirical mass

$= 92/46$

$= 2$

therefore the formula of the compound is $\mathrm{N_2O_4}$.

56. 3.0 molal $NaOH$ solution has a density of 1.110 g/ml. The molarity of the solution is :-

(A) 2.94 (B) 3.25 (C) 3.64 (D) 1.25

Ans. : a

$\mathrm{m} = \frac{1000\,\mathrm{M}}{1000\mathrm{d} - \mathrm{MM_A}}$

$3 = \frac{1000\,\mathrm{M}}{1000 \times 1.1 - \mathrm{M} \times 40}$

57. The simplest formula of a compound containing 50% of element 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

Ans. : b

(b)

Element	$\%(a)$	At.wt.(b)	a/b	Ratio
X	50	10	5	2
Y	50	20	2.5	1

simplest formula = X_2Y

58. A hydrocarbon contains 86% carbon, $488\,ml$ of the hydrocarbon weight $1.68\,g$ at STP. Then the hydrocarbon is an

(A) Alkane (B) Alkene (C) Alkyne (D) Arene

Ans. : b

(b)

Element	At.wt.	Mole	Ratio	Empirical formula
$C = 86\%$	12	7.1	1	CH_2
$H = 14\%$	1	14	2	Beleongs to alkene C_nH_{2n}

59. The percentage of P_2O_5 in diammonium hydrogen phosphate $(NH_4)_2HPO_4$ is

(A) 23.48 (B) 46.96 (C) 53.78 (D) 714

Ans. : c

(c) $\underset{2(36+1+31+64)=264}{2(NH_4)_2HPO_4} \equiv \underset{62+80=142}{P_2O_5}$

% of $P_2O_5 = \frac{\text{wt. of} P_2O_5}{\text{wt of salt}} \times 100 = \frac{142}{264} \times 100 = 53.78\%$.

60. In which of the following pairs of compounds the ratio of C, H and O is same

(A) Acetic acid and methyl alcohol (B) Glucose and acetic acid

(C) Fructose and sucrose (D) All of these

Ans. : b

(b) Glucose - $C_6H_{12}O_6$

Ratio of C, H and O $= 1:2:1$

In acetic acid $CH_3 - \underset{\underset{O}{||}}{C} - O - H$

Ratio of C, H and O $1:2:1$.

61. A compound $(60\,g)$ on analysis gave $C = 24\,g$, $H = 4\,g$, $O = 32\,g$. Its empirical formula is

(A) $C_2H_2O_2$ (B) C_2H_2O (C) CH_2O_2 (D) CH_2O

Ans. : d

(d) $C = 24\,gm$, $H = 4\,gm$, $O = 32\,gm$

So, Molecular formula $= C_2H_4O_2$

So, Empirical formula $= CH_2O$ (Simplest formula).

62. A $400\,mg$ iron capsule contains $100\,mg$ of ferrous fumarate, $(CHCOO)_2Fe$. The percentage of iron pasent in it is approximately .... %

(A) 33 (B) 25 (C) 14 (D) 8

Ans. : d

(d) Molecular weight of $(CHCOO)_2Fe = 170$

Fe present in 100 mg of $(CHCOO)_2Fe$

$= \frac{56}{170} \times 100\, mg = 32.9\, mg$

This is present in 400 mg of capsule

% of Fe in capsule $= \frac{32.9}{400} \times 100 = 8.2.$

63. The mass of carbon present in 0.5 $mole$ of $K_4[Fe(CN)_6]$ is .... g

(A) 1.8 (B) 18 (C) 3.6 (D) 36

Ans. : d

1 $mole$ of $K_4[Fe(CN)_6]$ contains 6 $mole$ carbon i.e. 72 g

64. $N_2H_4 + IO_3^- + 2H^+ + Cl^- \rightarrow ICl + N_2 + 3H_2O$

The equivalent masses of N_2H_4 and KIO_3 respectively are

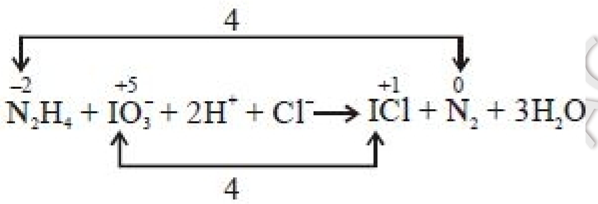
(A) 8 and 35.6 (B) 8 and 87

(C) 8 and 53.5 (D) 16 and 53.5

Ans. : c

Eq. wt. of $\mathrm{N_2H_4} = \frac{32}{4} = 8$

Eq. wt. of $\mathrm{KIO_3} = \frac{214}{4} = 53.5$



65. 74.5 g of a metallic chloride contains 35.5 g of chlorine. The equivalent mass of metal is

(A) 19.5 (B) 35.5 (C) 39 (D) 74.5

Ans. : c

equivalent weight of metal

$= \frac{\text{weight of metal}}{\text{weight of chlorine}} \times$ eq. wt. of Cl

$\mathrm{E_M} = \frac{(74.5 - 35.5)}{35.5} \times 35.5 = 39.0$

66. The equivalent weight of H_3PO_4 in following reaction is $H_3PO_4 + Ca(OH)_2 \rightarrow CaHPO_4 + 2H_2O$

(A) 98 (B) 49 (C) 32.66 (D) 40

Ans. : b

The reaction is

$H_3PO_4 + Ca(OH)_2 \rightarrow CaHPO_4 + 2H_2O$

In this reaction

$H_3PO_4 \rightarrow HPO_4^{2-} + 2H^+$

Orthophosphoric acid leaves 2 hydrogen ions.

Hence, its valency factor is $= 2$

Equivalent weight $= \frac{\text{Molecular Weight}}{2}$

Molecular weight $= 1 \cdot 3 + 31 + 4 \cdot 16 = 98$

Therefore,

The equivalent weight is $= \frac{98}{2} = 49$

67. The equivalent weight of H_3PO_4 in following reaction is

$H_3PO_4 + Ca(OH)_2 \rightarrow CaHPO_4 + 2H_2O$

(A) 98 (B) 49 (C) 32.66 (D) 40

Ans. : b

The reaction is

$H_3PO_4 + Ca(OH)_2 \rightarrow CaHPO_4 + 2H_2O$

In this reaction

$H_3PO_4 \rightarrow HPO_4^{2-} + 2H^+$

Orthophosphoric acid leaves 2 hydrogen ions.

Hence, its valency factor is $= 2$

Equivalent weight $= \frac{\text{Molecular Weight}}{2}$

Molecular weight $= 1 \cdot 3 + 31 + 4 \cdot 16 = 98$

Therefore,

The equivalent weight is $= \frac{98}{2} = 49$

68. The precentage of Se in peroxidase enzyme is 0.5% by mass (atomic mass of Se $= 78.4\,amu$). Then, the minimum moleuclar mass of enzyme which contains not more than one Se atom is

(A) $1.568 \times 10^4\,amu$ (B) $1.568 \times 10^7\,amu$

(C) $1.568 \times 10^3\,amu$ (D) $1.568 \times 10^6\,amu$

Ans. : a

Minimum molecular mass $= \frac{\text{at. mass } \times 100}{\text{\% of element}}$

$= \frac{78.4 \times 100}{0.5}$

$= 1.568 \times 10^4$

69. At NTP, 5.6 $litre$ of a gas weight 8 $gram$. The vapour density of gas is :-

(A) 32 (B) 40 (C) 16 (D) 8

Ans. : c

mol of gas $= \frac{\text{mass}}{m01 - \text{ mass}} = \frac{V_{S.T.P}}{22.4}$

$\frac{8}{m} = \frac{5.6}{22.4}$

$\therefore$ m = 32; vapour density = 16

70. Suppose two elements X and Y combine to form two compounds XY_2 and X_2Y_3. If 0.05 mole of XY_2 weighs 5 g while 3.011×10^{23} molecules of X_2Y_3 weighs 85 g, then atomic masses of X and Y are respectively :

(A) 20, 30 (B) 30, 40 (C) 40, 30 (D) 80, 60

Ans. : c

$0.05\,\mathrm{mol\,XY_2} = 5\,\mathrm{gm}$

$1\ mol\,\mathrm{XY_2} = \frac{5}{0.05} = 100$

$\mathrm{X + 2Y = 100}$

3.01×10^{23} molecule $\mathrm{X_2Y_3} = 85\,\mathrm{gm}$

$1\,\mathrm{mol\,X_2Y_3} = \mathrm{N_A}$ molecule $= 170\,\mathrm{gm}$

$\mathrm{2X + 3Y = 170}$.........(ii)

On solving.

$\mathrm{X = 40.\ Y = 30}$

71. Equivalent weights of X_2Y and X_2Y_3 are 38 and 18 respectively. Find the atomic masses of X and Y:-

(A) 30, 8 (B) 30, 16 (C) 10, 16 (D) None

Ans. : b

$\mathrm{E_{X_2Y}} = \frac{\mathrm{X}}{1} + \frac{\mathrm{Y}}{2} = 38,\ \mathrm{2X + Y = 76}$

$\mathrm{E_{x_2y_3}} = \frac{\mathrm{x}}{3} + \frac{\mathrm{Y}}{2} = 18,\ \mathrm{2X + 3Y = 108}$

On solving,

$\mathrm{X = 30, Y = 16}$

72. Rearrange the following (I to IV) in the order of increasing masses:

(I)0.5 $mole$ of O_3 (II)0.5 gm atom of oxygen $(III)3.011 \times 10^{23}$ molecules of O_2 (IV)5.6 $litre$ of CO_2 at STP

(A) $II < IV < III < I$ (B) $II < I < IV < III$

(C) $IV < II < III < I$ (D) $I < II < III < IV$

Ans. : a

(a) (I) 0.5 mole $\mathrm{O_3} = 24\,\mathrm{g\,O_3}$

(II) 0.5 g atom of oxygen $= 8\,\mathrm{g}$

(III) $\frac{3.011 \times 10^{23}}{6.022 \times 10^{23}} \times 32 = 16\,\mathrm{g\,O_2}$

(IV) $\frac{5.6}{22.4} \times 44\,\mathrm{g\,CO_2} = 11\,\mathrm{g\,CO_2}$

73. Isotope | Relative abundance | (%) Atomic mass (u)

Isotope	Relative abundance	(%) Atomic mass (u)
^{12}C	98.8	12
^{13}C	1.18	13.1
^{14}C	0.02	14.1

From above data what is the molecular mass of CH_4 containing all isotopes of carbon but hydrogen on ^1_1H .... u (Given that atomic mass of hydrogen $= 1.008$)

(A) 16.004 (B) 16.21 (C) 16.125 (D) 16.42

Ans. : a

Average atomic mass of carbon

$= 0.988 \times 12 + 0.0118 \times 13 + 0.0002 \times 14$

$= 12.0122$

74. M is the molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it is converted into K_2MnO_4 is

(A) M (B) $M/3$ (C) $M/5$ (D) $M/7$

Ans. : a

(a) $\overset{+7}{KMnO_4} \rightarrow \overset{+6}{K_2MnO_4}$

Change in 0.5 per atom $= 7 - 6 = 1$

$\therefore$ Equivalent weight of $KMnO_4$ $= \frac{\text{Molecular weight of } KMnO_4}{\text{Change of 0.5 per atom}} = \frac{M}{1} = M.$

75. The mass of 112 cm^3 of CH_4 gas at STP is .... g

(A) 0.16 (B) 0.8 (C) 0.08 (D) 1.6

Ans. : c

(c) $n = \frac{W}{M} = \frac{V}{22400}; \frac{W}{16} = \frac{112}{22400}; W = 0.08\, gm.$

76. The volume occupied by 4.4 g of CO_2 at STP is L

(A) 22.4 (B) 2.24 (C) 0.224 (D) 0.1

Ans. : b

(b) 44 g CO_2 occupies 22.4 L at STP

4.4 g CO_2 occupies $= \frac{22.4}{44} \times 4.4 = 2.24\, L.$

77. 12 g of Mg (at. mass 24) on reacting completely with acid gives hydrogen gas, the volume of which at STP would be L

(A) 22.4 (B) 11.2 (C) 44.8 (D) 6.1

Ans. : b

(b) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

24 g Mg evolves 22.4 L H_2 at STP

$\therefore$ $12\,g\ Mg$ evolves H_2 at $STP\ \frac{22.4}{24} \times 12\ = 11.2\,L$ at STP.

78. One gram of hydrogen is found to combine with $80\,g$ of bromine one gram of calcium valency $= 2$ combines with $4\,g$ of bromine the equivalent weight of calcium is

(A) 10 (B) 20 (C) 40 (D) 80

Ans. : b

(b) One gram of hydrogen combines with $80\,gm$ of bromine.

So, equivalent weight of bromine $= 80\,gm$

$4\,gm$ of bromine combines with $1\,gm$ of Ca

$\therefore$ $80\,gm$ of bromine combines with = $\frac{1}{4} \times 80 = 20$.

79. The number of gram atoms of oxygen present in 0.3 gram mole of $(COOH)_2.2H_2O$ is

(A) 0.6 (B) 1.8 (C) 1.2 (D) 3.6

Ans. : b

(b) $1\ mole\ (COOH)_2\ .\ 2H_2O$ has $96\,gm$ oxygen

$\therefore$ 0.3 mole $(COOH)_2\ .\ 2H_2O$ has $96 \times 0.3 = 28.8\,gm$

$\therefore$ No. of gram atoms of oxygen $= \frac{28.8}{16} = 1.8$.

80. The element whose a atom has mass of $10.86 \times 10^{-26}\ kg$ is

(A) Boron (B) Calcium (C) Silver (D) Zinc

Ans. : d

(d) 1 atom has mass $= 10.86 \times 10^{-26} kg\ = 10.86 \times 10^{-23}\ gm$

6.023×10^{23}atoms has mass =$10.86 \times 10^{-23} \times 6.023 \times 10^{23}$ = $65.40\ gm$

This is the atomic weight of Zn.

81. Caffeine has a molecular weight of 194. If it contains 28.9% by mass of nitrogen, number of atoms of nitrogen in one molecule of caffeine is

(A) 4 (B) 6 (C) 2 (D) 3

Ans. : a

(a) $100\,gm$ caffeine has $28.9\,gm$ nitrogen

$194\,gm$ caffeine has = $\frac{28.9}{100} \times 194 = 56.06\,gm$

$\therefore$ No. of atoms in caffeine $= \frac{56.06}{14} \approx 4$.

82. Equivalent weight of crystalline oxalic acid is

(A) 30 (B) 63 (C) 53 (D) 45

Ans. : b

(b) Equivalent weight $= \frac{\text{Molecularweight}}{\text{Valency}}$

Molecular weight of $\begin{matrix} COOH \\ | \\ COOH \end{matrix} \cdot 2H_2O = \frac{126}{2} = 63.$

83. The vapour density of a gas is 11.2. The volume occupied by $11.2\,g$ of the gas at STP will be.....L

(A) 11.2 (B) 22.4 (C) 1 (D) 44.8

Ans. : a

(a) Molecular weight $= 2 \times V.D = 2 \times 11.2 = 22.4$

$22.4\,gm$ of gas occupies $22.4\,L$ at $S.T.P.$

$\therefore\ 11.2\,gm$ of gas occupies $\frac{22.4}{22.4} \times 11.2 = 11.2\,L.$

84. One litre of a gas at STP weight $1.16\,g$ it can possible be

(A) C_2H_2 (B) CO (C) O_2 (D) CH_4

Ans. : a

(a) $1\,L$ of gas at $S.T.P.$ weight $1.16\,g$

$\therefore\ 22.4\,L$ of gas at $S.T.P.$ weight $= 22.4 \times 1.16 = 25.984 \approx 26$

This molecular weight indicates that given compound is C_2H_2.

85. 7.5 grams of a gas occupy 5.8 litres of volume at STP the gas is

(A) NO (B) N_2O (C) CO (D) CO_2

Ans. : a

(a) $5.8\,L$ of gas has mass $= 7.5\,gm$

$\therefore\ 22.4\,L$ of gas has mass $= \frac{7.5}{5.8} \times 22.4 = 28.96$

So molecular weight = 29

So, molecular formula of compound is NO

86. $74.5\,g$ of a metallic chloride contain $35.5\,g$ of chlorine. The equivalent weight of the metal is

(A) 19.5 (B) 35.5 (C) 39 (D) 78

Ans. : c

(c) wt. of metallic chloride $= 74.5$

wt. of chlorine = 35.5

$\therefore$ wt. of metal $= 74.5 - 35.5 = 39$

Equivalent weight of metal $= \frac{\text{weightofmetal}}{\text{weightofchlorine}} \times 35.5$

$= \frac{39}{35.5} \times 35.5 = 39$

87. Sulphur forms the chlorides S_2Cl_2 and SCl_2. The equivalent mass of sulphur in SCl_2 is......$g/mole$

(A) 8 (B) 16 (C) 64.8 (D) 32

Ans. : b

(b)The atomic weight of sulphur = 32

In SCl_2 valency of sulphur = 2

So equivalent mass of sulphur $= \frac{32}{2} = 16.$

88. 'A' sample of $[Cu(NH_3)_4]SO_4$ contains 2.4×10^{24} ammonia molecules. The moles of $[Cu(NH_3)_4]SO_4$ in given sample will be

(A) 6×10^{23} (B) 4 (C) 3 (D) 1

Ans. : d

$1\ mol$ of $[Cu(NH_3)_4]SO_4$ have $4\ mol$ of NH_3

6.022×10^{23} atom have $1\ mol$ of NH_3

then 2.4×10^{24} atom have $4\ mol$ of NH_3

89. At STP the moles of oxygen in $2.8\,L$ of CO_2 gas is

(A) 1 (B) 0.5 (C) 0.25 (D) 0.125

Ans. : c

moles of $\mathrm{CO_2} = \frac{\text{Volume}}{22.4} = \frac{2.8}{22.4} = 0.125\,\mathrm{mol}$

Moles of oxygen $= 0.125 \times 2 = 0.25\,\mathrm{mol}$

90. Which of the following has minimum number of atoms

(A) $12\,g\,He$ (B) $1.8\,g\,water$

(C) $22\,g\,CO_2$ (D) $2.45\,g$ sulphuric acid

Ans. : d

$\mathrm{He} \Rightarrow \frac{12}{4} = 3\,\mathrm{mol}$ atoms, $\mathrm{H_2O} \Rightarrow \frac{1.8}{18} = 0.1\,\mathrm{mol}$

$0.1 \times 3 = 0.3\,\mathrm{mol}$ atom

$\mathrm{CO_2} \Rightarrow \frac{22}{44} = 0.5\,\mathrm{mol} : 0.5 \times 3 = 1.5\,\mathrm{mol}$ atoms

$\mathrm{H_2SO_4} \Rightarrow \frac{2.45}{98} = 0.025\,\mathrm{mol} : 0.025 \times 7 = 0.175\,\mathrm{mol\,atoms}$

91. A sample of ammonium phosphate, $(NH_4)_3PO_4$, contains $6\,moles$ of hydrogen atoms. The number moles of oxygen atoms in the sample is

(A) 1 (B) 2 (C) 4 (D) 6

Ans. : b

No. of $H-$ atoms $= 12$

No. of $O-$ atoms $= 4$

$\therefore$ so, ratio of no. of atoms = ratio of no. of moles

$\frac{12}{4} = \frac{6}{n_o}$

$n_o = 2$

92. Number of atoms in $24\,g$ of He is .... $\mathrm{N_A}$

(A) 1 (B) 2 (C) 4 (D) 6

Ans. : d

No. of mole of $He\ (n) = \frac{W}{\text{At. wt.}} = \frac{24}{4} = 6$

$\text{No. of atom} = \text{Mole} \times N_A = 6\,N_A$

93. The number of moles of a gas in 1 m^3 of volume at NTP is

(A) 4.46 (B) 0.446 (C) 1.46 (D) 44.6

Ans. : d

$1\,m^3 = 1000\,L$

Number of moles $= \frac{1000}{22.4} = 44.6$

94. How many moles of $Mg_3[PO_4]_2$ will contain 0.50 $mole$ of oxygen atoms ?

(A) 6.025 (B) 0.625 (C) 0.0625 (D) 625

Ans. : c

1 mole of $Mg_3(PO_4)_2$ contains 8 moles of Oxygen Then,
8 moles of oxygen is contained by 1 mole of $Mg_3(PO_4)_2$.

0.50 moles of oxygen is contained by $\frac{0.50 \times 1}{8} = 0.0625$ moles of $Mg_3(PO_4)_2$.

So, your answer is 0.0625 moles

95. Which sample contains the largest number of atoms ?

(A) 1 mg of C_4H_{10} (B) 1 mg of N_2

(C) 1 mg of Na (D) 1 ml of H_2O

Ans. : d

$1\text{mg of } C_4H_{10} = \frac{14N}{58} \times 10^{-3}\text{atoms}$

$1\text{mg of } N_2 = \frac{2N \times 10^{-3}}{28}$ atoms

$1\text{mg of } Na = \frac{N \times 10^{-3}}{23}$ atoms

$1\text{mL} = 1\text{g}H_2O = \frac{3N}{18}$ atoms

96. Which of the following contain maximum number of carbon atoms?

(A) 15 gm ethane, C_2H_6 (B) 40.2 gm sodium oxalate, $Na_2C_2O_4$

(C) 72 gm glucose, $C_6H_{12}O_6$ (D) 35 gm pentene, C_5H_{10}

Ans. : d

$C_2H_6 \Rightarrow \frac{15}{30} \times N_A \times 2 = N_A\,C$ -atoms

$Na_2C_2O_4 \Rightarrow \frac{40.2}{134} \times N_A \times 2 = 0.6\,N_A\,C$ -atoms

$C_6H_{12}O_6 \Rightarrow \frac{72}{180} \times N_A \times 6 = 2.4\,N_A\,C$ -atoms

$C_5H_{10} \Rightarrow \frac{35}{70} \times N_A \times 5 = 2.5\,N_A\,C$ -atoms

97. Calculate the number of atoms of oxygen present in $176\,g$ of CO_2

(A) 2.408×10^{26} (B) 4.816×10^{23} (C) 1.204×10^{22} (D) 4.816×10^{24}

Ans. : d

No. of mole of $\mathrm{CO_2} = \frac{176}{44} = 4$

$\therefore$ No. of mole of O atom $= 4 \times 2 = 8$

$\therefore$ $\mathrm{No.\ of\ O\ atom} = 8 \times \mathrm{N_A}$

$= 8 \times 6.023 \times 10^{23} = 48.184 \times 10^{23}$

$= 4.8184 \times 10^{24}$

Butane and isobutane have same formula.

98. Which of the following has the smallest number of molecules

(A) $22.4 \times 10^3\,mL$ of $CO_2\,gas$ at STP

(B) $22\,g$ of $CO_2\,gas$

(C) $11.2\,L$ of $CO_2\,gas$ at STP

(D) $0.1\,mole$ of $CO_2\,gas$

Ans. : d

At condition $\mathrm{A} = 1$ mole

At condition $\mathrm{B} = 0.5$ mole

At condition $\mathrm{C} = 0.5$ mole

At condition $\mathrm{D} = 0.1$ mole

i.e. at condition D we have smallest number of mole so we also have smallest number of molecule in condition D.

99. $8\,g\,O_2$ has same number of atoms as that in

(A) $14g\,CO$ (B) $7g\,CO$ (C) $11g\,CO_2$ (D) $22g\,CO_2$

Ans. : b

mole $(\mathrm{n}) = \frac{\text{weight (w)}}{\text{atomic wt.}} = \frac{\text{No. of atom (N)}}{\mathrm{N_A}}$

in $8\,\mathrm{g}\,\mathrm{O_2}$ No. of atom

$\frac{8}{16} = \frac{N}{N_A} \Rightarrow N = \frac{N_A}{2}$

100. How many protons are present in $1.8\,g\,NH_4^+$ .... N_A

(A) 1 (B) 1.2 (C) 1.1 (D) 11

Ans. : c

No. of protons in one $\mathrm{NH_4^+}$ ion $= 7 + 4 = 11$

No. of $\mathrm{NH_4^+}$ ions in $1.8\,\mathrm{g} = \frac{1.8}{18} \times \mathrm{N_A} = 0.1\,\mathrm{N_A}$

$\mathrm{No.\ of\ protons\ in\ 1.8\,g\,NH_4^+} = 11 \times 0.1\,\mathrm{N_A}$

$= 1.1\,\mathrm{N_A}$

101. The weight of a molecule of the compound $C_{60}H_{122}$ is

(A) $1.4 \times 10^{-21}\, g$ (B) $1.09 \times 10^{-21}\, g$

(C) $5.025 \times 10^{23}\, g$ (D) $16.023 \times 10^{23}\, g$

Ans. : a

$\mathrm{C_{60}H_{122}} = 60 \times 12 + 122$

$= 720 + 122 = 842$

wt of a molecule $= 842 \times 1.67 \times 10^{-24}$

$= 1.406 \times 10^{-21}\,\mathrm{g}$

102. Find number of electrons present in $34\, g$ of $NH_3(g)$. ....N_A

(A) 2 (B) 1 (C) 20 (D) 10

Ans. : c

Moles of $\mathrm{NH_3} = \frac{34}{17} = 2$ moles

no. of $\mathrm{NH_3}$ molecules $= 2 \times \mathrm{N_A}$

one $\mathrm{NH_3}$ molecule contains 10 electron total no. of electrons $= 2 \times \mathrm{N_A} \times 10 = 20\,\mathrm{N_A}$

103. The largest number of molecules is in

(A) $25 g$ of CO_2 (B) $46 g$ of C_2H_5OH (C) $36 g$ of H_2O (D) $54 g$ of N_2O_5

Ans. : c

Number of molecules present in 'W' g of a compound $= \frac{W}{M} \times N_A$.

Here, N_A represents Avogadro's number. M represents the molar mass of compound.

Number of molecules present in $36\, g$ of water $= \frac{36}{18} \times N_A = 2\, N_A$

Number of molecules present in $28\, g$ of $CO = \frac{46}{46} \times N_A = N_A$

Number of molecules present in $46\, g$ of $C_2H_5OH = \frac{46}{46} \times N_A = N_A$

Number of molecules present in $54\, g$ of $N_2O_5 = \frac{54}{108} \times N_A = 0.5\, N_A$

104. How many $H-$ atoms are present in $0.046\, g$ of ethanol

(A) 6×10^{20} (B) 1.2×10^{21}

(C) 3×10^{21} (D) 3.6×10^{21}

Ans. : d

(d) Mol. wt of $C_2H_5OH = 2 \times 12 + 5 + 16 + 1 = 64$

$\because$ $48\, g\, C_2H_5OH$ has H atom $= 6 \times N_A$

$\therefore$ $0.046\, g$ C_2H_5OH has H atoms $= \frac{6 \times 6.02 \times 10^{23} \times 0.046}{46} = 3.6 \times 10^{21}$

105. The number of sodium atoms in 2 moles of sodium ferrocyanide is

(A) 12×10^{23} (B) 26×10^{23}

(C) 34×10^{23} (D) 48×10^{23}

Ans. : d

(d) As we know that four sodium atom are present in sodium ferrocyanide $[Na_4Fe(CN)_6]$

Hence, number of Na atoms = No. of moles $\times$ number of atom $\times$ Avogadro's number

$2 \times 4 \times 6.023 \times 10^{23} = 48 \times 10^{23}$

106. $2\,g$ of oxygen contains number of atoms equal to that in

(A) $0.5\,g$ of hydrogen (B) $4\,g$ of sulphur (C) $7\,g$ of nitrogen (D) $2.3\,g$ of sodium

Ans. : b

(b) $2\,gm$ of oxygen contains atom $= \frac{2}{16} = \frac{1}{8}\,mole$

also $4\,g$ of sulphur $= \frac{4}{32} = \frac{1}{8}\,mole.$

107. The number of moles of sodium oxide in $620\,g$ of it is .... moles

(A) 1 (B) 10 (C) 18 (D) 100

Ans. : b

(b)Sodium oxide $\rightarrow$ Na_2O

Molecular weight $= 46 + 16 = 62$

$62\,gm$ of Na_2O = $1\,mole$

$620\,gm$ of Na_2O= $10\,mole.$

108. The largest number of molecules is in

(A) $34\,g$ of water (B) $28\,g$ of CO_2

(C) $46\,g$ of CH_3OH (D) $54\,g$ of N_2O_5

Ans. : a

(a) (a) $34\,gm$ of water

$18\,gm$ H_2O =6.023×10^{23} molecule $\therefore$ $34\,gm$ H_2O = $\frac{6.023 \times 10^{23}}{18} \times 34$ $= 11.37 \times 10^{23}$ mole

(b) $28\,gm$ of CO_2 $44\,gm$ $CO_2 = 6 \times 10^{23}$ molecules

$28\,gm$ CO_2 $= \frac{6 \times 10^{23}}{44} \times 28 = 3.8 \times 10^{23}$

(c) $46\,gm$ of CH_3OH $32\,gm$ CH_3OH $= 6 \times 10^{23}$ molecules

$46\,gm$ CH_3OH $= \frac{6 \times 10^{23}}{32} \times 46 = 8.625 \times 10^{23}$

(d) $108\,gm$ of $N_2O_5 = 6 \times 10^{23}$ molecules

$54\,gm$ of N_2O_5 $= \frac{6 \times 10^{23}}{108} \times 54 = 3 \times 10^{23}$ molecules.

109. The number of molecules in $4.25\,g$ of ammonia are

(A) 0.5×10^{23} (B) 1.5×10^{23} (C) 3.5×10^{23} (D) 1.8×10^{32}

Ans. : b

(b) Molecular weight of NH_3 is 17

According to the mole concept

17 gm NH_3 has molecules $= 6.02 \times 10^{23}$

$\therefore$ 1 gm NH_3 has molecules $= \frac{6.02 \times 10^{23}}{17}$

$\therefore$ 4.25 gm NH_3 has molecules $= \frac{6.02 \times 10^{23} \times 4.25}{17} = 1.5 \times 10^{23}$ $molecule$

110. Volume of a gas at STP is 1.12×10^{-7} cc. Calculate the number of molecules in it

(A) 3.01×10^{20} (B) 3.01×10^{12}

(C) 3.01×10^{23} (D) 3.01×10^{24}

Ans. : b

(b) 22400 cc of gas at STP has 6×10^{23}molecules

$\therefore$ 1.12×10^{-7} of gas at STP has $\frac{6 \times 10^{23} \times 1.12 \times 10^{-7}}{22400} = .03 \times 10^{14} = 3 \times 10^{12}$.

111. How many mole of helium gas occupy 22.4 L at 0^oC at 1 atm. pressure

(A) 0.11 (B) 0.9 (C) 1 (D) 1.11

Ans. : c

(c) 1 mole of any gas at STP occupies 22.4 L.

112. Which of the following has least mass

(A) 2 g atom of nitrogen (B) 3×10^{23} atoms of C

(C) 1 mole of S (D) 7.0 g of Ag

Ans. : b

(b) (a) 2 gm atom of nitrogen $= 28$ gm

(b) 6×10^{23} atoms of C has mass $= 12$ gm

3×10^{23} atoms of C has mass $= \frac{12 \times 3 \times 10^{23}}{6 \times 10^{23}} = 6$ gm

(c) 1 mole of S has mass $= 32$ gm

(d) 7.0 gm of Ag

So, lowest mass = 6 gm of C.

113. Among the following pairs of compounds, the one that illustrates the law of multiple proportions is

(A) NH_3 and NCl_3 (B) H_2S and SO_2

(C) CuO and Cu_2O (D) CS_2 and $FeSO_4$

Ans. : c

According to the concept of law of multiple proportions, if two elements chemically combine to give two or more compounds, then the weight of one element which combines with the fixed weight of the other element in those compound, bear simple multiple ratios to one another.

Hence, CuO and Cu_2O form two different compounds in a ratio of $1:2$ with the fixed weight of oxygen.

114. If the density of a solution is $3.12\ gm/ml$, the mass of $15\ ml$ solution in significant figures is ………… gm

(A) 4.7 (B) 4680×10^{-3} (C) 4.680 (D) 46.80

Ans. : a

Density of solution $= 3.12\mathrm{gmL}^{-1}$
Volume of solution $= 1.5\mathrm{mL}$
Mass of solution = Volume $\times$ Density
$= 1.5\mathrm{mL} \times 3.12\mathrm{gmL}^{-1}$
$= 4.68\mathrm{g} = 4.7\mathrm{g}$ (up to 2 significant figures)

115. Which of the following units represents the largest amount of energy

(A) Electron volt (B) Erg (C) Joule (D) Calorie

Ans. : d

$1eV =$ 1 electron-volt energy $= 1.6 \times 10^{-19} J$
1 erg energy $= 10^{-7} J$
1 Joule $= 1 J$
1 Calorie energy $= 4.18 J$
Hence, answer is option D.

116. A sample was weighted using two different balances. The result's were (i) $3.929\ g$ (ii) $4.0\ g$. How would the weight of the sample be reported……g

(A) 3.929 (B) 3 (C) 3.9 (D) 3.93

Ans. : d

(d) Round off the digit at 2^{nd} position of decimal $3.929 = 3.93$.

117. Given $P = 0.0030\ m$, $Q = 2.40\ m$, $R = 3000\ m$, Significant figures in P, Q and R are respectively

(A) $2, 3, 4$ (B) $2, 3, 1$ (C) $4, 2, 1$ (D) $4, 2, 3$

Ans. : b

(b) Given $P = 0.0030\ m$, $Q = 2.40\ m$ & $R = 3000\ m$ In $P(0.0030)$ initial zeros after the decimal point are not significant. Therefore, significant figures in $P(0.0030)$ are 2. Similarly in $Q(2.40)$ significant figures are 3 as in this case final zero is significant. In $R = (3000)$ all the zeroes are significant hence, in R significant figures are 4.

118. Molarity (M) of an aqueous solution containing xg of anhyd. $CuSO_4$ in 500 mL solution at 32 °C is 2×10^{-1}M. Its molality will be. . . . . . $\times 10^{-3}$ m (nearest integer). [Given density of the solution = 1.25 g/mL.]

(A) 160 (B) 164 (C) 167 (D) 168

Ans. : b

$M_{rol^n} = v_{sol^n} \times d_{sol^n}$

$= 500 \times 1.25 = 625$ g

Mass of solute (x) $= 0.2 \times 0.5 \times 159.5$

$= 15.95$

$n_{solute} = 0.1,$

Mass of solvent = Mass of solution − Mass of solute

$= 625 - 15.95$

$= 609.05$

$$m = \frac{0.1}{\frac{609.05}{1000}}$$

$m = 0.164 = 164 \times 10^{-3}$

119. A solution is prepared by adding 1 mole ethyl alcohol in 9 mole water. The mass percent of solute in the solution is. . . . . . . (Integer Answer)

(Given : Molar mass in $gmol^{-1}$ Ethyl alcohol : 46,
water : 18)

(A) 20 (B) 22 (C) 30 (D) 35

Ans. : b

Mass percent of Alcohol

$$= \frac{\text{Mass of ethyl alcohol}}{\text{Total mass of solution}} \times 100$$

$$= \frac{1 \times 46}{1 \times 46 + 9 \times 18} \times 100 = \frac{4600}{208}$$

$= 22.11$ Or 22

120. Molality of an aqueous solution of urea is 4.44 m. Mole fraction of urea in solution is $x \times 10^{-5}$. Value of x is. . . . . . (integer answer)

(A) 70 (B) 73 (C) 74 (D) 80

Ans. : c

Molality of urea is 4.44 m, that means 4.44 moles of urea present in 1000gm of water.

$$\therefore X_{urea} = \frac{4.44}{4.44 + \frac{1000}{18}}$$

$= 0.0740$

74×10^{-3}

$X = 74$

121. Molality (m) of 3M aqueous solution of NaCl is:

(Given : Density of solution $= 1.25\ \mathrm{g\ mL}^{-1}$, Molar mass in $\mathrm{gmol}^{-1}: \mathrm{Na}-23, \mathrm{Cl}-35.5$)

(A) 2.90 m (B) 2.79 m (C) 1.90 m (D) 3.85 m

Ans. : b

3 moles are present in 1 litre solution

$$\text{molality} = \frac{3\times1000}{1.25\times1000-[3\times58.5]} = 2.79\ \mathrm{m}$$

122. The density of ' x ' M solution (' x ' molar) of NaOH is $1.12\ \mathrm{g\ mL}^{-1}$. while in molality, the concentration of the solution is 3 m (3molal). Then x is

(Given : Molar mass of NaOH is 40 g/mol)

(A) 3.5 (B) 3.0 (C) 3.8 (D) 2.8

Ans. : b

$$\text{Molality} = \frac{1000\times\mathrm{M}}{1000\times\mathrm{d}-\mathrm{M}\times(\mathrm{Mw})_{\text{solute}}}$$

$$3 = \frac{1000\times\mathrm{x}}{1000\times1.12-(\mathrm{x}\times40)}$$

x = 3

123. The Molarity (M) of an aqueous solution containing 5.85 g of NaCl in 500 mL water is :

(Given : Molar Mass Na: 23 and Cl: $35.5\mathrm{gmol}^{-1}$)

(A) 20 (B) 0.2 (C) 2 (D) 4

Ans. : b

$$\mathrm{M} = \frac{\mathrm{n}_{\mathrm{NaCl}}}{\mathrm{V}_{\mathrm{sol}}(\text{ in L})}$$

$$\mathrm{M} = \frac{\frac{5.85}{58.5}}{0.5} = 0.2\mathrm{M}$$

124. The molarity of 1 L orthophosphoric acid (H_3PO_4) having 70% purity by weight (specific gravity $1.54\ \mathrm{g\ cm}^{-3}$) is_____ M.

(Molar mass of $H_3PO_4 = 98\ \mathrm{g\ mol}^{-1}$)

(A) 9 (B) 10 (C) 11 (D) 12

Ans. : c

Specific gravity (density) $= 1.54$ g/cc.

Volume $= 1\ \mathrm{L} = 1000\mathrm{ml}$

Mass of solution $= 1.54 \times 1000$

$= 1540$ g

% purity of H_2SO_4 is 70%

So weight of $H_3PO_4 = 0.7 \times 1540 = 1078$ g

Mole of $H_3PO_4 = \frac{1078}{98} = 11$

Molarity $= \frac{11}{1\ L} = 11$

125. A solution of H_2SO_4 is $31.4\% H_2SO_4$ by mass and has a density of $1.25\ g/mL$. The molarity of the H_2SO_4 solution is ____________ M (nearest integer)[Given molar mass of $H_2SO_4 = 98\ g\ mol^{-1}$]

(A) 4 (B) 3 (C) 2 (D) 1

Ans. : a

$$M = \frac{n_{solute}}{V} \times 1000$$

$$= \frac{\left(\frac{31.4}{98}\right)}{\left(\frac{100}{1.25}\right)} \times 1000$$

$$= 4.005 \approx 4$$

126. Volume of $3\ M$ NaOH (formula weight $40\ g\ mol^{-1}$) which can be prepared from 84 g ofNaOH is____________ $\times 10^{-1}\ dm^3$.

(A) 8 (B) 7 (C) 9 (D) 10

Ans. : b

$$M = \frac{n_{NaOH}}{V_{sol}(\text{ in L})} \Rightarrow 3 = \frac{(84/40)}{V} \Rightarrow V = 0.7\ L = 7 \times 10^{-1}\ L$$

127. The quantity which changes with temperature is:

(A) Molarity (B) Mass percentage

(C) Molality (D) Mole fraction

Ans. : a

$$\text{Molarity} = \frac{\text{Moles of solute}}{\text{Volume of solution}}$$

Since volume depends on temperature, molarity will change upon change in temperature.

128. Combustion of glucose $(C_6H_{12}O_6)$ produces CO_2 and water. The amount of oxygen (in g) required for the complete combustion of 900 g of glucose is: [Molar mass of glucose in $gmol^{-1} = 180$]

(A) 480 (B) 960 (C) 800 (D) 32

Ans. : b

$$C_6H_{12}O_{6(s)} + 6O_{2(g)} \longrightarrow 6CO_{2(g)} + 6H_2O_{(\ell)}$$

$\frac{900}{180}$

$= 5$ mol   30 mol

Mass of O_2 required $= 30 \times 32 = 960gm$

129. The number of moles of methane required to produce $11\ gCO_2(g)$ after complete combustion is:

(Given molar mass of methane in $gmol^{-1}: 16$)

(A) 0.75 (B) 0.25 (C) 0.35 (D) 0.5

Ans. : b

$C_nH_{2an2} + \frac{3n+1}{2}O_2 \longrightarrow nCO_2 + (n+1)H_2O$
$CH_4 + 2O_2 4gm \longrightarrow CO_2 + 2H_2O 11gm$
0.25 mole $\quad 0.25$ mole

0.25 mole CH_4 gives 0.25 mole (or $11gm$)CO_2

130. $10\ mL$ of gaseous hydrocarbon on combustion gives $40\ mL$ of $CO_2(g)$ and $50\ mL$ of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is.......................

(A) 20 (B) 14 (C) 30 (D) 13

Ans. : b

$CxHy\ (10ml) + O_2 \rightarrow CO_2 + H_2O$

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

$10x\ 5y$
$10x = 40$
$x = 4$
$5y = 50$
$y = 10$
C_4H_{10}

131. Consider the following reaction:

$3PbCl_2 + 2(NH_4)_3PO_4 \rightarrow Pb_3(PO_4)_2 + 6NH_4Cl$

If 72mmol of $PbCl_2$ is mixed with 50mmol of $(NH_4)_3PO_4$, then amount of $Pb_3(PO_4)_2$ formed is......... mmol. (nearest integer)

(A) 24 (B) 22 (C) 25 (D) 30

Ans. : a

Limiting Reagent is $PbCl_2$ mmol of $Pb_5\left(PO_4\right)_2$ formed

$= \frac{\text{mmol of } PbCl_2 \text{ reacted}}{3}$

$= 24mmol$

132. $2\ L$ of $0.2\ MH_2SO_4$ is reacted with $2\ L$ of $0.1\ M\ NaOH$ solution, the molarity of the resulting product Na_2SO_4 in the solution is millimolar. (Nearest integer).

(A) 24 (B) 23 (C) 22 (D) 25

Ans. : d

$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

$0.4\,mol \quad 0.2 mol \quad -$

$0.3\,mol \quad - \qquad\qquad 0.1 mol$

Molarity of Na_2SO_4 is $\frac{0.1}{4} = 0.025\,M = 25\,mM$.

133. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R)

Assertion (A): At $10\,^{\circ}C$, the density of a $5\,M$ solution of KCl [atomic masses of K and Cl are 39 and $35.5\,g\,mol^{-1}$]. The solution is cooled to $-21\,^{\circ}C$. The molality of the solution will remain unchanged.

Reason (R): The molality of a solution does not change with temperature as mass remains unaffected with temperature.

In the light of the above statements, choose the correct answer from the options given below

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

Ans. : a

Molality is independent of temperature and hence both assertion and reason are true.

134. $4.5\,g$ of compound $A(MW = 90)$ was used to make $250\,mL$ of its aqueous solution. The molarity of the solution in M is $x \times 10^{-1}$. The value of x is .... (Rounded off to the nearest integer)

(A) 1 (B) 2 (C) 3 (D) 4

Ans. : b

$M = \frac{4.5/90}{250/1000} = 0.2$

$= 2 \times 10^{-1}$

135. Complete combustion of $1.80\,g$ of an oxygen containing compound $(C_xH_yO_2)$ gave $2.64\,g$ of CO_2 and $1.08\,g$ of H_2O. The percentage of oxygen in the organic compound is

(A) 51.63 (B) 63.53 (C) 53.33 (D) 50.33

Ans. : c

$n_C = n_{co_2} = \frac{2.64}{44} = 0.06$

$n_H = 2 \times n_{H_2O} = \frac{1.08}{18} \times 2 = 0.12$

$m_0 = 1.80 - 12 \times \frac{2.64}{44} - \frac{1.08}{18} \times 2$

$= 1.80 - 0.72 - 0.12 = 0.96gm$

$\%0 = \frac{0.96}{1.80} \times 100 = 53.33\%$

136. The number of significant figures in 50000.020×10^{-3} is ..... .

(A) 5 (B) 8 (C) 2 (D) 10

Ans. : b

50000.020×10^{-3}

_

137. If the concentration of glucose $(C_6H_{12}O_6)$ in blood is $0.72\ g\ L^{-1}$, the molarity of glucose in blood is ..... $\times 10^{-3}M$. (Nearest integer)
(Given: Atomic mass of $C = 12, H = 1, O = 16u$)

(A) 4 (B) 7 (C) 9 (D) 11

Ans. : a

molarty = moles/volume

$= \frac{0.72}{180} = 4 \times 10^{-3} = M$

138. The unit of the van der Waals gas equation parameter $'a'$ in $\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$ is :

(A) $kg\,m\,s^{-2}$ (B) $dm^3\ mol^{-1}$ (C) $kg\,m\,s^{-1}$ (D) $atm\,dm^6\ mol^{-2}$

Ans. : d

$\frac{an^2}{V^2} = atm \Rightarrow a = atm \times \frac{dm^6}{mol^2}$

139. 250 mL of $0.5\,M\,NaOH$ was added to 500 mL of $1\,M\,HCl$ The number of unreacted HCl molecules in the solution after complete reaction is ...... $\times 10^{21}$. (Nearest integer) $(N_A = 6.022 \times 10^{23})$

(A) 226 (B) 235 (C) 462 (D) 521

Ans. : a

We known that no. of moles = Vlitre × Molarity and No. of millimoles = $V_{ml} \times$ Molarity

so millimoles of NaOH = 250 × 0.5 = 125

Millimoles of HCl = 500 × 1 = 500

Now reaction is

$NaOH + HCL \rightarrow NaCl + H_2O$

t = 0 125 500 0 0

t = 0 0375 125 125

so millimoles of HCl left $= 375$

Moles of HCl $= 375 \times 10^{-3}$

No. of HCl molecules $= 6.022 \times 10^{23} \times 375 \times 10^{-3}$

$= 225.8 \times 10^{21}$

$\approx 226 \times 10^{21} = 226$

140. The molarity of the solution prepared by dissolving 6.3 g of oxalic acid $(H_2C_2O_4 \cdot 2H_2O)$ in 250 mL of water in $molL^{-1}$ is $x \times 10^{-2}$. The value of x is ..... . (Nearest integer)

[Atomic mass : $H: 1.0, C: 12.0, O: 16.0$]

(A) 0.20 (B) 2 (C) 200 (D) 20

Ans. : d

$$\left[H_2C_2O_4 \cdot 2H_2O\right] = \frac{\text{weight } / M_w}{V(L)}$$

$$\Rightarrow x \times 10^{-2} = \frac{6.3/126}{250/1000}$$

$x = 20$

141. The mole fraction of a solute in a 100 molal aqueous solution .... $\times 10^{-2}$ (Round off to the Nearest Integer).

[Given : Atomic masses : $H: 1.0\ u$, $O: 16.0\ u$]

(A) 64 (B) 52 (C) 44 (D) 62

Ans. : a

100 molal aqueous solution means there is 100 mole solute in $1 kg = 1000 gm$ water. Now,

mole-fraction of solute $= \frac{n_{\text{solute}}}{n_{\text{solute}} + n_{\text{solvent}}}$

$$= \frac{100}{100 + \frac{1000}{18}} = \frac{1800}{2800} = 0.6428$$

$= 64.28 \times 10^{-2}$

142. The formula of a gaseous hydrocarbon which requires 6 times of its own volume of O_2 for complete oxidation and produces 4 times its own volume of CO_2 is C_xH_y. The value of y is ....

(A) 13 (B) 10 (C) 8 (D) 5

Ans. : c

Combustion rx^n:

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

V	$6V$	$-$
$-$	$-$	$Vx = 4V$

$\Rightarrow x = 4$

Sinc: $(I)\ Vo_2 = 6 \times V_{c_x H_y}$

$\Rightarrow V\left(x + \frac{y}{4}\right) = 6V$

$\Rightarrow \left(x + \frac{y}{4}\right) = 6\,\Big] \Rightarrow 4 + \frac{y}{4} = 6$

$\Rightarrow y = 8$

143. Complete combustion of $3\,g$ of ethane gives $x \times 10^{22}$ molecules of water. The value of x is .... (Round off to the Nearest Integer). [Use: $N_A = 6.023 \times 10^{23}$; Atomic masses in u $C: 12.0$; $O: 16.0$; $H: 1.0$]

(A) 24 (B) 22 (C) 20 (D) 18

Ans. : d

moles of ethane $= \frac{3\text{ g}}{30\text{ g/mol}} = 0.1\text{ mol}$

$C_2H_6 + 3.5O_2 \rightarrow 2CO_2 + 3H_2O$

1 mol of ethane gives 3 mol of water

0.1 mol ethane gives 0.3 mol of water

Number of molecules in 0.3 mol water

$= 0.3 \times 6 \times 10^{23} = 18 \times 10^{22}$ molecules

value of x is 18

144. The number of atoms in 8 g of sodium is $x \times 10^{23}$. The value of x is .... (Nearest integer)

[Given : $N_A = 6.02 \times 10^{23}\ \text{mol}^{-1}$, Atomic mass of Na $= 23.0\,u$]

(A) 6 (B) 8 (C) 2 (D) 34

Ans. : c

$$\text{No. of atoms} = \frac{8}{23} \times 6.02 \times 10^{23} = 2.09 \times 10^{23}$$
$$\simeq 2 \times 10^{23}$$
$$= x \times 10^{23}$$

$x = 2$

145. The ratio of number of water molecules in Mohr's salt and potash alum is .... $\times 10^{-1}$

(A) 5 (B) 3 (C) 4 (D) 1

Ans. : a

Mohr's salt : $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$

The number of water molecules in Mohr's salt $= 6$

Potash alum : $KAl(SO_4)_2 \cdot 12H_2O$

The number of water molecules in potash alum $= 12$

So ratio of number of water molecules in Mohr's salt and potash alum $= \frac{6}{12}$

$= \frac{1}{2}$

$= 0.5$

$= 5 \times 10^{-1}$

146. A solution of two components containing n_1 moles of the 1^{st} component and n_2 moles of the 2^{nd} component is prepared. M_1 and M_2 are the molecular weights of component 1 and 2 respectively. If d is the density of the solution in $g\,mL^{-1}$, C_2 is the molarity and x_2 is the mole fraction of the 2^{nd} component, then C_2 can be expressed as

(A) $C_2 = \frac{1000x_2}{M_1 + x_2(M_2 - M_1)}$

(B) $C_2 = \frac{dx_2}{M_2 + x_2(M_2 - M_1)}$

(C) $C_2 = \frac{dx_1}{M_2 + x_2(M_2 - M_1)}$

(D) $C_2 = \frac{1000dx_2}{M_1 + x_2(M_2 - M_1)}$

Ans. : d

$$C_2 = \frac{x_2}{[x_2M_2 + (1 - x_2)M_2]/Cl} \times 1000$$

$$C_2 = \frac{1000dx_2}{M_1 + (M_2 - M_1)x_2}$$

147. 6.023×10^{22} molecules are present in $10\,g$ of a substance $'x'$. The molarity of a solution containing $5\,g$ of substance $'x'$ in $2\,L$ solution is.......... $\times 10^{-3}$

(A) 20 (B) 25 (C) 22 (D) 18

Ans. : b

moles $= \frac{\text{number of molecules}}{6 \times 10^{23}} = \frac{\text{given mass}}{\text{molar mass}}$

$\Rightarrow$ molar mas $= \frac{10 \times 6.023 \times 10^{23}}{6.023 \times 10^{22}} = 100g/mol$

$\Rightarrow$ molarity $= \frac{\text{moles of solute}}{\text{volume of sol}^n\ (\ell)} = \frac{(5/100)}{2}$

$= 0.025$

148. A $20.0\,mL$ solution containing $0.2\,g$ impure H_2O_2 reacts completely with $0.316\,g$ of $KMnO_4$ in acid solution. The purity of H_2O_2(in %) is........... (mol. wt. of $H_2O_2 = 34$; mol. wt. of $KMnO_4 = 158$)

(A) 90 (B) 95 (C) 85 (D) 80

Ans. : c

Eq of $H_2O_2 = Eq$ of $KMnO_4$

$x \times 2 = \frac{0.316}{158} \times 5$

$x = 5 \times 10^{-3} mol$

$m_{H_2O_2} = 5 \times 10^{-3} \times 34 = 0.17 gm$

$\% H_2O_2 = \frac{0.17}{0.2} \times 100 = 85$

149. The ratio of the mass percentages of $'C$ & H' and $'C$ & O' of a saturated acyclic organic compound $'X'$ are $4:1$ and $3:4$ respectively. Then, the moles of oxygen gas required for complete combustion of two moles of organic compound $'X'$ is

(A) 8 (B) 10 (C) 12 (D) 5

Ans. : d

$C : H = 4 : 1$

$C : O = 3 : 4$

Mass ratio

$C : H : O = 12 : 3 : 16$

Mole ratio

$C : H : O = 1 : 3 : 1$

Empirical formula $= CH_3O$

Molecular formula $= C_2H_6O_2$

(saturated acyclic organic compound)

$C_2H_6O_2 + \frac{5}{2} O_2 \longrightarrow 2CO_2 + 3H_2O$

2 $mole$ 5 mol

Moles of O_2 required $= 5$ moles

150. The volume (in mL) of 0.125 M AgNO_3 required to quantitatively precipitate chloride ions in 0.3 g of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is $M_{[\text{Co}(\text{NH}_3)_6]\text{Cl}_3} = 267.46 \text{ g/mol}$ $M_{\text{AgNO}_3} = 169.87 \text{ g/mol}$

(A) 32.06 (B) 38.25 (C) 26.92 (D) 24.34

Ans. : c

Number of moles of Cl^- precipitated in $\left[\text{Co}\left(\text{NH}_3\right)_6\right]\text{Cl}_3$ is equal to number of moles of AgNO_3 used.

$\frac{0.3}{267.46} \times 3 = \frac{0.125 \times \text{V}}{1000}$

where V is volume of AgNO_3 (in mL$\big)$ $\text{V} = 26.92\text{mL}$

151. $A + 2B + 3C \rightleftharpoons AB_2C_3$ Reaction of $6.0\,g$ of A, 6.0×10^{23} atoms of B, and $0.036\,mol$ of C yields $4.8\,g$ of compound AB_2C_3 . If the atomic mass of A and C are 60 and $80\,amu$, respectively, the atomic mass of B is .... amu (Avogadro no . $= 6 \times 10^{23}$)

(A) 50 (B) 60 (C) 70 (D) 40

Ans. : a

$A + 3B + 3C \rightleftharpoons AB_2C_3 . . . . . (1)$

No. of moles of $A = \frac{6.0\,g}{60\,g/\,mol} = 0.1\,mol$

No. of moles of $B = \frac{6.00 \times 10^{23}}{6.000 \times 10^{23}} = 1\,mol$

No. of moles of $C = 0.036$

AB_2C_3 formed accordingly to C which is a limiting reagent.

Since 3 moles of C are used in (1)

So it gives 1 mole of AB_2C_3

$n_{AB_2C_3} = \frac{0.036}{3} = 0.012$

$= \frac{Given\,mass\,(4.8)}{Molecular\,mass\,(M.M)}$

Mol.mass $= \frac{4.8}{0.012} = 400$

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

$\Rightarrow x = 50$

152. The treatment of an aqueous solution of $3.74g$ of $Cu(NO_3)_2$ with excess KI results in a brown solution along with the formation of a precipitate. Passing H_2S through this brown solution gives another precipitate X. The amount of X (in g) is. . . . . [Given : Atomic mass of $H = 1$, $N = 14$, $O = 16$, $S = 32$, $K = 39$, $Cu = 63$, $I = 127$]

(A) 0.20 (B) 0.25 (C) 0.30 (D) 0.32

Ans. : d

$2Cu\left(NO_3\right)_2{}_{0.02} + 5KI \longrightarrow Cu_2I_2 + KI_3 + 4KNO_3$

$KI_3 + H_2S \longrightarrow S\downarrow + KI + 2HI$

0.01

$n_S = 0.01$ mole

weight of sulphur $= 32 \times 0.01 = 0.32gm$

153. To check the principle of multiple proportions, a series of pure binary compounds (P_mQ_n) were analyzed and their composition is tabulated below. The correct option(s) is(are)

Compound	Weight % of P	Weight % of Q

1	50	50
2	44.4	55.6
3	40	60

(A) If empirical formula of compound 3 is P_3Q_4, then the empirical formula of compound 2 is P_3Q_5.

(B) If empirical formula of compound 3 is P_3Q_2 and atomic weight of element P is 20 , then the atomic weight of Q is 45 .

(C) If empirical formula of compound 2 is PQ, then the empirical formula of the compound 1 is P_5Q_4.

(D) If atomic weight of P and Q are 70 and 35 , respectively, then the empirical formula of compound 1 is P_2Q.

(A) A, B (B) A, C (C) A, D (D) B, C

Ans. : d

Compound	Weight % of P	Weight % of Q
1	50	50
2	44.4	55.6
3	40	60

For option (A)

Let atomic mass of P be M_p and atomic mass of Q be M_Q Molar ratio of atoms $P:Q$ in compound 3 is

$$\frac{40}{M_p}:\frac{60}{M_Q}=3:4$$

$$\frac{2M_Q}{3M_p}=\frac{3}{4}\Rightarrow 9M_p=8M_Q$$

Molar ratio of atoms $P:Q$ in compound 2 is

$$\frac{44.4}{M_p}:\frac{55.6}{M_Q}$$

$$=44.4M_Q:55.6M_P$$

$$=44.4M_Q:55.6\times\frac{8M_Q}{9}$$

$$=44.4:55.6\times\frac{8}{9}$$

$$=9:10$$

$\Rightarrow$ Empirical formula of compound 2 is therefore P_9Q_{10} Option (A) in incorrect

For option (B)

Molar Ratio of atoms $P:Q$ in compound 3 is $\frac{40}{M_P}:\frac{60}{M_Q}=3:2$

$$\frac{2M_Q}{3M_p}=\frac{3}{2}\Rightarrow 9M_p=4M_Q$$

If $M_P=20 \quad \Rightarrow M_Q=\frac{9\times 20}{4}=45$

Option (B) is correct

For option (C)

Molar ratio of atoms $P:Q$ in compound 2 is

$\frac{44.4}{M_p}:\frac{55.6}{M_Q} = 44.4M_Q:55.6M_p = 1:1$

$\Rightarrow \frac{M_p}{M_Q} = \frac{44.4}{55.6}$

Molar ratio of atoms $P:Q$ in compound 1 is

$\frac{50}{M_p}:\frac{50}{M_Q} = M_Q:M_p$

$= 55.6:44.4$

$\simeq 5:4$

Hence, empirical formula of compound 1 is P_5Q_4

Hence, option (C) is correct

For option (D)

Molar ratio of atoms $P:Q$ in compound 1 is

$\frac{50}{M_p}:\frac{50}{M_Q} = M_Q:M_p$

$= 35:70 = 1:2$

Hence, empirical formula of compound 1 is PQ_2 Hence, option (D) is incorrect

154. The mole fraction of urea in an aqueous urea solution containing $900g$ of water is 0.05 . If the density of the solution is $1.2gcm^{-3}$, the molarity of urea solution is. . . . . (Given data : Molar masses of urea and water are $60gmol^{-1}$ and $18gmol^{-1}$, respectively)

(A) 2.50 (B) 2.55 (C) 2.60 (D) 2.98

Ans. : d

$X_{\text{ure2}} = 0.05 = \frac{n}{n+50}$

$19n = 50$

$n = 2.6315$

$V_{sol} = \frac{(2.6315 \times 60 + 900)}{1.2} = 881.5789ml$

$\text{Molarity} = \frac{2.6315 \times 1000}{881.5789} = 2.9849$

$\text{Molarity} = 2.98M$

155. In neutral or faintly alkaline solution, 8 moles of permanganate anion quantitatively oxidize thiosulphate anions to produce X moles of a sulphur containing product. The magnitude of X is

(A) 5 (B) 6 (C) 8 (D) 9

Ans. : b

$8MnO_4^- + 3S_2O_3^{-2} + H_2O \rightarrow 8MnO_2 + 6SO_4^{-2} + 2OH^-$

$\therefore$ Mole of SO_4^{2-} formed from 8 moles of MnO_4^- $= 6$

156. Given that the abundances of isotopes ^{54}Fe, ^{56}Fe and ^{57}Fe are 5%, 90% and 5%, respectively, the atomic mass of Fe is

(A) 55.85 (B) 55.95 (C) 55.75 (D) 56.05

Ans. : b

Avergae atomic mass of Fe $= \sigma$ abundance $\times$ atomic mass of isotope

$= \frac{5 \times 54 + 90 \times 56 + 5 \times 57}{100} = 55.95\ u$

157. An aqueous solution of 6.3 g of oxalic acid dihydrate is made up of to 250 ml. The volume of 0.1 $N\,NaOH$ required to completely neutralise 10 ml of this solution is .... ml

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

Ans. : a

(a) Oxalic acid $NaOH$

$N_1V_1 = N_2V_2$

$\left[\frac{W}{E} \times \frac{1000}{V}\right] \times V_1 = N_2V_2$

$\frac{6.3}{63} \times \frac{1000}{250} \times 10 = 0.1 \times V$

$V = 40\,ml.$

158. 1.12 ml of a gas is produced at STP by the action of 4.12 mg of alcohol, with methyl magnesium iodide. The molecular mass of alcohol is

(A) 16 (B) 41.2 (C) 82.4 (D) 156

Ans. : c

(c) 1.12 mL is obtained from 4.12 mg

$\therefore$ 22400 mL will be obtained from

$\frac{4.12}{1.12} \times 22400\,mg = 84.2\,g$

$ROH_{1\,mol.} + CH_3MgI \rightarrow CH_4 + Mg <^{OR}_{I}\ {}_{1\,mol = 22400\,cc}$

159. The weight of 1×10^{22} molecules of $CuSO_4.5H_2O$ is .... g

(A) 41.59 (B) 415.9 (C) 4.159 (D) None of these

Ans. : c

(c) [Molecular weight of $CuSO_4.5H_2O = 63.5 + 32 + 64 + 90 = 249.5$]

6×10^{23} molecules has weight $= 249.5\,gm$

1×10^{22} molecules has weight $= \frac{249.5 \times 1 \times 10^{22}}{6 \times 10^{23}}$

$= 41.58 \times 10^{-1} = 4.158$

160. One calorie is equal to

(A) 0.4184 $Joule$ (B) 4.184 $Joule$ (C) 41.84 $Joule$ (D) 418.4 $Joule$

Ans. : b

We need to find 1 calorie is equal to how many joules.

A calorie is the amount of energy that is supplied in the nutrients that make up food. Because it is a form of energy, calories can be converted to joules through a measurement of heat.

1 calorie $= 4.186$ joules. is the required answer.

161. The number of significant figures in 6.02×10^{23} is

(A) 23 (B) 3 (C) 4 (D) 26

Ans. : b

When numbers are written in scientific notation, then the number of digits between 1 and 10 gives the number of significant figures.

Thus, the number 6.02×10^{23} contains 3 significant figures.

All the three digits (6, 0 and 2) are significant.

162. $81.4\,g$ sample of ethyl alcohol contains $0.002\,g$ of water. The amount of pure ethyl alcohol to the proper number of significant figures is

(A) $81.4\,g$ (B) $71.40\,g$ (C) $81.398\,g$ (D) $81\,g$

Ans. : a

(a) Pure ethyl alcohol $= 81.4 - 0.002 = 81.398$.

according to significant number it is $= 81.4$.

163. Find the moleculer weight of a solid containing 20% by mole of S atoms, whose $400\ g$ provides just sufficient S atoms to produce enough H_2SO_4 to neutralise $100\ g\ NaOH$

(A) 96 (B) 64 (C) 128 (D) 32

Ans. : (B) 64

164. The moles of H^+ from H_2O alone in a $1\ l$, $\sqrt{5} \times 10^{-7}\ M\ HCL$ solution at $25\ ^oC$ is ($\sqrt{5}$ = 2.23)

(A) 10^{-7} (B) 6.85×10^{-8} (C) 3.85×10^{-8} (D) 10^{-8}

Ans. : (C) 3.85×10^{-8}

165. The number of ions present in $2.0\ L$ of a solution of $0.8\ M\ K_4[Fe(CN)_6]$ is

(A) 4.8×10^{22} (B) 4.8×10^{24} (C) 9.6×10^{24} (D) 9.6×10^{22}

Ans. : b

Mole of $K_4Fe(CN)_6 = 2 \times 0.8 = 1.6$

Also 1 mole of $K_4Fe(CN)_6$ gives $4K^+$ and $1Fe(CN)_6^{4-}$ ion.

Thus total ions in 1.6 mole

$= 1.6 \times 5 \times N_A = 48.184 \times 10^{23}$

166. 4.3 gm of an alkane is burnt in sufficient oxygen. The CO_2 formed reacts completely with 300 ml, 2 N $NaOH$ solution producing Na_2CO_3. The alkane should be

(A) C_3H_8 (B) $C_{12}H_{26}$ (C) C_6H_{14} (D) C_2H_6

Ans. : c

$$\underset{\frac{0.3}{n}\text{ mole}}{C_nH_{2n+2}} + \frac{(3n+1)}{2}O_2 \rightarrow \underset{0.3\text{ mole}}{nCO_2} + (n+1)H_2O$$

$$\underset{0.3\,mole}{CO_2} + \underset{0.6\,mole}{2NaOH} \rightarrow Na_2CO_3 + H_2O$$

$$\frac{0.3}{n} = \frac{4.3}{(14n+2)} \Rightarrow n = 6$$

167. The density of a solution containing 13% by mass of H_2SO_4 is 1.09 gm/ml. The molarity and normality of the solution are respectively :-

(A) $14.45\,M, 28.90\,N$ (B) $1.445\,M, 2.89\,N$ (C) $1.09\,M, 2.18\,N$ (D) None

Ans. : b

Volume of 100 gram of the solution $= 100/\text{d}$

$= \frac{100}{1.09}\text{mL} = \frac{100}{1.09 \times 1000}\text{litre}$

$= \frac{1}{1.09 \times 10}$ litre

Number of moles of H_2SO_4 in 100 gram of the $= 13/98$

Molarity $=$ No of moles of H_2SO_4/ Volume of solution in litre

$= 13/98 \times 1.09 \times 10/1 = 1.445\text{M}$

normality $=$ molarity $\times$ $n -$ factor $=$ molarity $\times 2 = 1.446 \times 2 = 2.892\text{N}$

168. A solution containing Na_2CO_3 and $NaOH$ requires 300 ml of 0.1 N HCl using phenolpthalein as an indicator. Methyl orange is then added to the above titrated solution when a further 25 ml of 0.2 N HCl is required. The amount of $NaOH$ present in solution is .... g ($NaOH = 40,\ Na_2CO_3 = 106$)

(A) 0.6 (B) 1 (C) 1.5 (D) 2

Ans. : b

(b) (I) Phenopthalein indicate partial neutralisation of $Na_2CO_3 \rightarrow NaHCO_3$

Meq. of Na_2CO_3+ Meq. of $NaOH$ = Meq. of HCl

$\frac{W}{E} \times 1000 + \frac{W}{E} \times 1000 = NV$

(Suppose $Na_2CO_3 = a\,gm$, $NaOH = b\,gm$)

$\frac{a}{106} \times 1000 + \frac{b}{40} \times 1000 = 300 \times 0.1$.....(1)

(II) Methyl orange indicate complete neutralisation

HCl HCl

$N_1V_1 = N_2V_2$,

$25 \times 0.2 = 0.1 \times V_2$

so $V_2 = 50\, ml$ excess

$\therefore\ \frac{a}{53} \times 1000 + \frac{b}{40} \times 1000 = 350 \times 0.1$.....(2)

From (1) and (2) $b = 1\, gm$.

169. $150\, g\, CaCO_3$ sample was taken. On its complete decomposition $56\, g\, CaO$ is produced. The % purity of sample is .... %

(A) 33.33 (B) 37.33 (C) 50 (D) 75

Ans. : b

Let us consider the reaction first:

$CaCO_3 \longrightarrow CaO + CO_2$

Mass of $CaCO_3 = 150g$

Mass of $CaO = 56g$

Percentage Purity of Sample $=$? ? ?

Percentage Purity $= \frac{\text{Mass of pure product}}{\text{Mass of impure product}} \times 100\%$

So, % Purity $= \frac{56g}{150g} \times 100\% = 0.37333 \times 100\% = 37.33\%$

So the correct answer should be (b) but it should be 37.33%

170. One and a half mole of oxygen combine with aluminium to form Al_2O_3, then the weight of aluminium metal used in this reaction is .... gms (Atomic weight of $Al = 27$)

(A) 27 (B) 81 (C) 108 (D) 54

Ans. : d

3 moles of oxygen react with 108 g of Al

1 moles of oxygen react with $108/3\, g$ of Al

And 0.5 mole of oxygen react with $108 \times 0.5/3\, g$ of Al

$Al = 18\ gram$

1 moles of oxygen react with $108/3\, g$ of Al

And 1 mole of oxygen react with $108 \times 1/3\, g$ of Al

$Al = 36\ gram$

$= 18 + 36$

$54\, gm$

171. $20\, mL$ of CO_2 gas are passed over excess of red hot coke. the volume of CO evolved is .... mL

$CO_{2\,(g)} + C_{(s)} \rightarrow 2CO_{(g)}$

(A) 10 (B) 20 (C) 30 (D) 40

Ans. : d

20mL of CO_2 gas is passed over red hot coke. The volume of carbon monoxide evolved is 40 mL.

$CO_2(g) + C(s) \rightarrow 2CO(g)$

1 mole of CO_2 gas will form 2 moles of CO gas.
since volume is proportional to number of moles,
$20\mathrm{mL}$ of CO_2 gas will form $2 \times 20 = 40\mathrm{mL}$ of CO gas.

172. $18\,L$ mixture of N_2 and H_2 gives maximum $6\,L$ of NH_3 at same temperature and pressure then what will be ratio of N_2 and H_2 initially taken ?

(A) $1:5$ (B) $1:1$ (C) $1:2$ (D) (A) and (B) both

Ans. : (D) (A) and (B) both

173. $5\,mole$ of A, $6\,moles$ of B and excess amount of C are mixed to produce a final product D, according to the reaction

$A + 2B \rightarrow I$

$I + C \rightarrow B + D$

What is the maximum moles of D can be produced assuming that the products formed can also be reused in the reactions ? .... moles

(A) 3 (B) 4.5 (C) 5 (D) 6

Ans. : c

$A + 2B \longrightarrow I$

$I + C \longrightarrow D + B$

3 moles of $A +$ 6 moles of $B \longrightarrow$ 3 moles of I

3 moles of $I +$ 3 moles of $C \longrightarrow$ 3 moles of $D +$ 3 moles of B Now, Dividing equation by 2

1.5 moles of $A +$ 3 moles of $B \longrightarrow$ 1.5 moles of I

1.5 moles of $I +$ 1.5 moles of $C \longrightarrow$ 1.5 moles of $D +$ 1.5 moles of B

Now, 1.5 moles of B are reused.

Dividing previous 2 equation by 3

0.5 moles of $A +$ 1 moles of $B \longrightarrow$ 0.5 moles of I

0.5 moles of $I +$ 0.5 moles of $C \longrightarrow$ 0.5 moles of $B +$ 0.5 moles of D

Now, all of A is consumed hence no reaction, will take place.

Total amount of $D = 3 + 0.5 + 1.5 = 5.0$ moles

174. If $0.5\,mol$ of $CaBr_2$ is mixed with $0.2\,mol$ of K_3PO_4 then the maximum number of moles of $Ca_3(PO_4)_2$ obtained will be

(A) 0.5 (B) 0.2 (C) 0.7 (D) 0.1

Ans. : d

Balanced equation :

$\underset{3}{3CaBr_2} + \underset{2}{2K_3PO_4} \rightarrow \underset{1}{Ca_3(PO_4)_2} + \underset{6}{6KBr}$

Given: 0.5 mol $CaBr_2$

ratio of given/required stoichiometry moles: $0.5/3 = 0.16666$

given: 0.2 mol K_3PO_4

Ratio of given/required stoichiometry moles: $0.2/2 = 0.1$

$0.1 < 0.1666$ so, $CaBr_2$ is excess reactant, K_3PO_4 is limiting reactant.
So only $0.1 \times 3 = 0.3$ moles of $CaBr_2$ will be used and 0.1 mol of $Ca_3(PO_4)_2$ will be formed.

175. When $1\,L$ of CO_2 is heated with graphite, the volume of the gases collected is $1.8\,L$. What will be the number of moles of CO produced at STP ?

(A) 0.0357 (B) 0.0714 (C) 0.0803 (D) 14

Ans. : b

$$CO_{2(g)} + C_{(s)} \xrightarrow{\Delta} 2CO_{(g)}$$

Initially $1\,L$ excess 0
After reaction $1-x$ excess $2x$
total volume of gases after reaction $= 1 + x = 1.8\,\mathrm{L}$
$\therefore x = 0.8\,\mathrm{L}$
and volume of CO $= 2\mathrm{x} = 1.6\,\mathrm{L}$
$\therefore$ moles of CO at STP $= \frac{1.6}{22.4} = 0.0714$

176. What volume of CO_2 at STP is obtained by thermal decomposition of $20\,g\,KHCO_3$ .... L [Atomic weight of $K = 39$]
$2KHCO_3(s) \rightarrow K_2O(s) + 2CO_2(g) + H_2O(g)$

(A) 44.8 (B) 4.48 (C) 22.4 (D) None of the above

Ans. : b

Molecular mass of $KHCO_3 = 39 + 1 + 12 + 16 \times 3$
$= 40 + 12 + 48$
$= 100\,g$
no of mole $= \frac{20g}{100g} = \frac{1}{5} mol$
If 2 mole of $KCO_3 \rightarrow 2$ mol of CO_2
1 mole $= \frac{2}{2}1$ mole of CO_2
$\frac{1}{5}$ mole $= \frac{1}{5}$ mole of CO_2
$1\mathrm{mol} = 22.4$ liter
$\frac{1}{5}\mathrm{mol} = \frac{22.4}{5}$ liter
$= 4.48$ liter

177. $5\,L$ of a gaseous mixture of ethane and propane are burnt to produce total $11\,L$ of CO_2 . Volume percent of C_2H_6 in the initial mixture is

(A) 10 (B) 20 (C) 80 (D) 60

Ans. : c

$$\underset{x\,litre}{C_2H_6} + \underset{(5-x)\,litre}{C_3H_8} + O_2 \rightarrow \underset{11\,litre}{CO_2}$$

$2 \times x + 3(5 - x) = 1 \times 11$
$2x + 15 - 3x = 11$
$x = 4\,L$

Volume percentage of $C_2H_6 = \frac{4}{5} \times 100 =$
80%

178. How many moles of lead (II) chloride will be formed from a reaction between $6.5\ g$ of PbO and $3.2\ g\ HCl$?

(A) 0.011 (B) 0.029 (C) 0.044 (D) 0.333

Ans. : b

The reagent which is present in smaller quantity is called the limiting reagent and the moles of product depends on it and number of moles

$= \frac{\text{weight}}{\text{molecular weight}}$

$\mathrm{PbO}_{207.2+16=223.2} + \mathrm{HCl}_{2(35.5+1)=73} \rightarrow \mathrm{PbCl_2}_{207.2+71=278.2} + \mathrm{H_2O}$

Here, 1 $mole$ of PbO reacts with 2 $moles$ of HCl, thus PbO is the limiting reagent

$\because$ 223.2 g PbO gives $\mathrm{PbCl_2} = 278.2\mathrm{g}$

$\therefore$ 6.5g PbO will give $\mathrm{PbCl_2}$

$= \frac{278.2}{232.2} \times 6.5\ \mathrm{g}$

$= \frac{278.2 \times 6.5}{223.2 \times 278.2}\ \mathrm{mol}$

179. An element, X has the following isotopic composition :

$^{200}X : 90\%$ $^{199}X : 8.0\%$ $^{202}X : 2.0\%$

The weighted average atomic mass of the naturally occurring element X is closest to......amu

(A) 201 (B) 202 (C) 199 (D) 200

Ans. : d

Weight of $^{200}X = 0.90 \times 200 = 180.00u$

Weight of $^{199}X = 0.08 \times 199 = 15.92u$

Weight of $^{202}X = 0.02 \times 202 = 4.04u$

Total weight $= 199.96 \approx 200u$

180. Which of the following has maximum number of molecules

(A) 16 gm of O_2 (B) 16 gm of NO_2 (C) 7 gm of N_2 (D) 2 gm of H_2

Ans. : d

(d) 2 gm. Hydrogen has maximum number of molecules than others.

181. Molarity of liquid HCl with density equal to 1.17 g/cc is

(A) 36.5 (B) 18.25 (C) 32.05 (D) 4.65

Ans. : c

(c) Molarity = mole/litre

1 cc contains 1.17 gm

$\therefore$ 1000 cc contains

1170 gm $\frac{1170\,gm}{\text{Mol. wt.}} = \frac{1170}{36.5} = 32.05\, mole/litre (Mol.\ wt.\ of HCl = 36.5)$

182. Haemoglobin contains 0.33% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (At. wt. of $Fe = 56$) present in one molecule of haemoglobin is

(A) 6 (B) 1 (C) 4 (D) 2

Ans. : c

(c) 100 $gm\ Hb$ contain $= 0.33\, gm\ Fe$

$\therefore$ 67200 $gm\ Hb = \frac{67200 \times 0.33}{100}\, gm\ Fe$

gm atom of $Fe = \frac{672 \times 0.33}{56} = 4.$

183. The total number of valence electrons in 4.2 gm of N_3^- ion is .... N_A (N_A is the Avogadro's number)

(A) 1.6 (B) 3.2 (C) 2.1 (D) 4.2

Ans. : a

(a) 42 g of N_3^- ions have 16 N_A valence electrons 4.2 g of N_3^- ion have $= \frac{16\, N_A}{42} \times 4.2 = 1.6\, N_A$.

184. Calculate ....M Molarity of a 63% $w/w\, HNO_3$ solution if density is 5.4 g/mL

(A) 54 (B) 12 (C) 10 (D) 8

Ans. : a

$M = \frac{\%W,W \times d \times 10}{M_{\text{solute}}} = \frac{63 \times 5.4 \times 10}{63} = 54$

185. Arrange the following in the order of increasing mass (atomic mass: $O = 16, Cu = 63, N = 14$)

$I.$ one atom of oxygen

$II.$ one atom of nitrogen

$III.$ 1×10^{-10} mole of oxygen

$IV.$ 1×10^{-10} mole of copper

(A) $II < I < III < IV$ (B) $I < II < III < IV$

(C) $III < II < IV < I$ (D) $IV < II < III < I$

Ans. : a

Mass of 6.023×10^{23} atoms of oxygen $= 16\, g$

Mass of one atoms of oxygen $= \frac{16}{6.023 \times 10^{23}} = 2.66 \times 10^{-23}\, g$

Mass of 6.023×10^{23} atoms of nitrogen $= 14\, g$

Mass of one atom of nitrogen

$= \frac{14}{6.023 \times 10^{23}} = 2.32 \times 10^{-23} g$

Mass of 1×10^{10} mole of oxygen $= 16 \times 10^{-10}$

Mass of 1 mole of copper $= 63\,g$

Mass of 1 mole of oxygen $= 16\,g$

Mass of 1×10^{-10} mole of copper

$$= 63 \times 1 \times 10^{-10}$$
$$= 63 \times 10^{-10}$$

So, the order of increasing mass is

$II < I < III < IV$

186. Sulphur forms the chlorides S_2Cl_2 and SCl_2. The equivalent mass of sulphur in SCl_2 is.......g/mol

(A) 8 (B) 16 (C) 64.8 (D) 32

Ans. : b

The atomic weight of sulphur $= 32$

In SCl_2 valency of sulphur $= 2$

So equivalent mass of sulphur $= \frac{32}{2} = 16$

187. Which has the maximum number of molecules among the following ?

(A) $44\,g\,CO_2$ (B) $48\,g\,O_3$ (C) $8\,g\,H_2$ (D) $64\,g\,SO_2$

Ans. : c

	No. of molecules
Moles of $CO_2 = \frac{44}{44} = 1$	N_A
Moles of $O_2 = \frac{48}{48} = 1$	N_A
Moles of $H_2 = \frac{8}{2} = 4$	N_A
Moles of $SO_2 = \frac{64}{64} = 1$	N_A

188. An aqueous solution of $6.3\,g$ of oxalic acid dihydrate is made up to $250\,ml$. The volume of $0.1\,N\,NaOH$ required to completely neutralise $10\,ml$ of this solution is.......ml

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

Ans. : b

Normality of oxalic acid

$= \frac{6.3 \times 1000}{63 \times 250} = 0.4\,N$

$N_1V_1 = N_2V_2$

$10 \times 0.4 = V \times 0.1 = 40\,ml$

189. For preparing $0.1\,N$ solution of a compound from its impure sample of which the percentage purity is known, the weight of the substance required will be

(A) less than the theoretical weight

(B) more than the theoretical weight

(C) same as the theoretical weight

(D) none of these

Ans. : b

More than theoretical weight since impurity will not contribute.

190. Assertion : The normality of $0.3\,M$ aqueous solution of H_3PO_3 is equal to $0.6\,N$.

Reason : Equivalent weight of $H_3PO_3 = \dfrac{Molecular\,weight\,of\,H_3PO_3}{3}$

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

Ans. : c

Assertion is true, reason is false. $Eq.\,wt.$ of $H_3PO_3 = \frac{mol.\,wt}{2}$ [$\therefore$ Basicity of $H_3PO_3 = 2$]

191. Calculate the millimoles of SeO_3^{2-} in solution on the basis of following data : $70\,ml$ of $\dfrac{M}{60}$ solution of $KBrO_3$ was added to SeO_3^{2-} solution. The bromine evolved was removed by boiling and excess of $KBrO_3$ was back titrated with $12.5\,mL$ of $\dfrac{M}{25}$ solution of $NaAsO_2$. The reactions are given below.

$I.\ SeO_3^{2-} + BrO_3^{-} + H^{+} \rightarrow SeO_4^{2-} + Br_2 + H_2O$

$II.\ BrO_3^{-} + AsO_2^{-} + H_2O \rightarrow Br^{-} + AsO_4^{3-} + H^{+}$

(A) 1.6×10^{-3} (B) 1.25 (C) 2.5×10^{-3} (D) None of these

Ans. : c

$(I)\ \overset{+4}{Se}O_3^{2-} + \overset{+5}{Br}O_3^{-} + H^{+} \rightarrow \overset{+6}{Se}O_4^{2-} + \overset{0}{Br_2} + H_2O$

$(II)\ \overset{+5}{Br}O_3^{-} + \overset{+3}{As}O_2^{-} + H_2O \rightarrow \overset{-1}{Br^{-}} + \overset{+5}{As}O_4^{3-} + H^{+}$

In reaction (II)

gm. eq. of BrO_3^{-} = gm. eq. of AsO_2^{-}

$n_{BrO_3^-} \times 6 = n_{AsO_2^-} \times 2$

$= \frac{12.5}{1000} \times \frac{1}{25} \times 2 = 10^{-3}$

$n_{BrO_3^-} = \frac{10^{-3}}{6}$

In reaction (I)

moles of BrO_3^- consumed

$= \frac{70}{1000} \times \frac{1}{60} - \frac{10^{-3}}{6} = 10^{-3}$

gm eq. of SeO_3^{2-} = gm. eq. of BrO_3^-

$n_{SeO_3^{2-}} \times 2 = 10^{-3} \times 5$;

$n_{SeO_3^{2-}} = 2.5 \times 10^{-3}$

192. A compound possesses 8% sulphur by mass. The least molecular mass is

(A) 200 (B) 400 (C) 155 (D) 355

Ans. : b

(b) 8 gm sulphur is present in 100 gm of substance

$\therefore$ 32 gm sulphur will present = $\frac{100}{8} \times 32 = 400$.

193. The maximum amount of $BaSO_4$ precipitated on mixing equal volumes of $BaCl_2$ (0.5 M) with H_2SO_4 (1 M) will correspond to ....M

(A) 0.5 (B) 1 (C) 1.5 (D) 2

Ans. : a

(a) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

One mole of $BaCl_2$ reacts with one mole of H_2SO_4.

Hence 0.5 mole will react with 0.5 mole of H_2SO_4 i.e. $BaCl_2$ is the limiting reagent.

194. Normality of 2 M sulphuric acid is

(A) $2N$ (B) $4N$ (C) $\frac{N}{2}$ (D) $\frac{N}{4}$

Ans. : b

(b)H_2SO_4 is dibasic $N = 2M = 2 \times 2 = 4$.

195. An aqueous solution of oxalic acid dihydrate contains its 6.3 g in 250 ml. The volume of 0.1 N $NaOH$ required to completely neutralize 10 ml of this solution .... ml

(A) 4 (B) 20 (C) 2 (D) 40

Ans. : d

Normality of oxalic acid solution

$= \frac{6.3 \times 1000}{63 \times 250} = 0.4\,N$

Now from

$N_1V_1 = N_2V_2$

$0.4 \times 10 = 0.1 \times V_2$

$V_2 = 40\,mL$

196. Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL. The molality of the solution is .... mol kg^{-1}

(A) 2.28 (B) 0.44 (C) 1.14 (D) 3.28

Ans. : a

Molality (m) $= \frac{1000 \times M}{1000 \times d - M \times M_{\text{sdute}}}$

Here $M =$ molarity, M solute $=$ molecular mass of solute, $d =$ density of solution

$\therefore m = \frac{1000 \times 2.05}{1000 \times 1.02 - 2.05 \times 00} = 2.28$

197. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms ?

(A) 1.25×10^{-2} (B) 2.5×10^{-2} (C) 0.02 (D) 3.125×10^{-2}

Ans. : d

In one $\mathrm{Mg}_3\left(\mathrm{PO}_4\right)_2$ molecule no of oxygen atoms $= 8$

So if there is $M\, mole$ of $Mg_3\left(\mathrm{PO}_4\right)_2$ molecules then no of moles of oxygen atoms is $= \mathrm{M} \times 8$

According to question,

$M \times 8 = 0.25$

$\Rightarrow M = 0.03125 = 3.125 \times 10^{-2}$

198. If we consider that 1/6, in place of 1/12, mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of a substance will

(A) Decrease twice

(B) Increase two fold

(C) Remain unchanged

(D) Be a function of the molecular mass of the substance

Ans. : c

This is because when you consider 1/6 in place of 1/12, since mass of carbon atom is sti $= 2\, amu$ (where amul is new amu unit and amu is old amu unit)

So, now

$N_A 1$ (avogadro's number) becomes half $(N/2)$ since the weight of carbon corresponding to a becomes $6\, gm$ in place of 12. (where $N_A 1$ is new avogardo's number and N_A is old avogardro's number)

And we know that mass of one mole of substance is $= N_A \times\ amu$

So new atomic mass $= N_A 1 \times\ amu 1 = N_A 2 \times 2\, amu = N_A \times\ amu =$ old atomic weight.

199. $16.25\, g$ metal chloride is obtained on complete conversion of $8\, g$ metal oxide into metal chloride then what will be the equivalent weight of metal

(A) 18.66 (B) 37.32 (C) 9.33 (D) 2.91

Ans. : a

$$\frac{\text{wt of metal oxide}}{\text{wt of metal chloide}} = \frac{E_{\text{metal}} + E\left(O^{-2}\right)}{E_{\text{metal}} + E\left(Cl^{-}\right)}$$

$$\Rightarrow \frac{8}{16.25} = \frac{E+8}{E+35.5}$$

$$\Rightarrow 8.25\text{E} = 154$$

$$E = 18.66$$

200. Which of the following is Loschmidt number

(A) 6×10^{23} (B) 2.69×10^{19} (C) 3×10^{23} (D) None of these

Ans. : b

(b) The no. of molecules present in $1\,ml$ of gas at STP is known as Laschmidt number.

$22400\,ml$ of gas has total no. of molecules $= 6.023 \times 10^{23}$

$1\,ml$ of gas has total no. of molecules $= \frac{6.023 \times 10^{23}}{22400} = 2.69 \times 10^{19}$.

----- Life is like riding a bicycle. To keep your balance, you must keep moving -----