Daily Tutorial Sheet-1	JEE Advanced (Archive)

1. (20%, 80%)

Boron isotopes $^{10.1}_{5}B$, $^{11.01}_{5}B$

$$\frac{x}{100}\times(10.01)+\frac{100-x}{100}(11.01)=10.81$$

$\Rightarrow$ $x = 20$

$\therefore$ 20% $^{10.01}_{5}B$ and 80% $^{11.01}_{5}B$

2.(A)

$$2Ag_2CO_3(s) \xrightarrow{\Delta} 4Ag(s)+2CO_2(g)+O_2(g)$$

2 mole	yields	4 mole
(2×276) gm	yields	(4×108) gm
$\therefore$ 2.76 gm	would yield	2.16 gm

3.(A)

$$\underset{1\text{ mole}}{Zn}+H_2SO_4 \longrightarrow ZnSO_4+\underset{1\text{ mole}}{H_{2(g)}} \qquad \underset{1\text{ mole}}{Zn}+2NaOH \longrightarrow Na_2ZnO_2+\underset{1\text{mole}}{H_{2(g)}}$$

Hence ratio is 1 : 1

4.(A)

	Number of molecules
36 gm of H_2O	$\frac{36}{18}\times N_A = 2N_A$
28 gm of CO	$\frac{28}{28}\times N_A = N_A$
46 gm of C_2H_5OH	$\frac{46}{46}\times N_A = N_A$
54 gm of N_2O_5	$\frac{54}{108}\times N_A = 0.5\ N_A$

5.(A) CO_2 molecule has $\underset{\text{from carbon}}{(6\ e^-)}+\underset{\text{from oxygen}}{(8\ e^-\times 2)}=22\ e^-$

6.(Isotopic Existence)

Atomic mass is defined as weighted average (as per their percentage composition in nature) of all the naturally occurring isotopic atoms of an element compared to $\left(\frac{1}{12}\right)^{th}$ mass of ^{12}C – isotope of carbon.

7.(0.473)

Vapour Density of mixture × 2 = Average molar mass of mixture

Average Molar Mass = 38.3 × 2 = 76.6

For 100 gm mixture let mass of $\begin{cases} NO_2 \quad N_2O_4 \\ x\text{ gm} \quad (100-x)g \\ \frac{x}{46}+\frac{100-x}{92}=\frac{100}{76.6} \end{cases}$

$\Rightarrow$ $100+x=120.1$ $\Rightarrow$ $x = 20.1$ gm

$$^{n}NO_2=\frac{20.1}{46}=0.437$$

8. **6.023 × 10²⁴**

$18 \text{ ml } H_2O \Rightarrow 18 \text{ gm } H_2O \Rightarrow 1 \text{mole } H_2O$ (d = 1 gm/ml)

1 molecule of H_2O has $\underset{\text{(of H-atom)}}{1e^- \times 2} + \underset{\text{(of O- atom)}}{8e^-} = 10e^-$

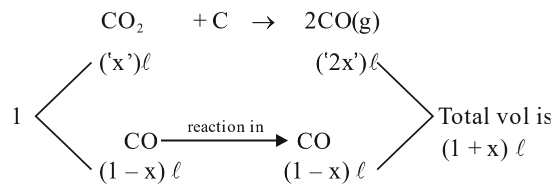
$\therefore$ 1 mole H_2O has 10 moles $e^- \Rightarrow 6.022 \times 10^{24} e^-$

9. **C-12 isotope**

$\left(\frac{1}{12}\right)^{th}$ mass of ^{12}C -isotope of carbon

10. **(a)** $V_{CO_2} = 0.6L$, $V_{CO} = 0.4L$ **(b)** 24gm/mol

(a) $CO_2 + C \rightarrow 2CO(g)$



$(1+x)\ell = 1.6\ \ell$

$x = 0.6\ \ell$

$\Rightarrow V_{CO_2} = 0.6\ \ell$

$V_{CO} = 0.4\ \ell$

(b) Formula of metal nitride would be M_3N_2

Let atomic mass of metal be 'm' gm/mol.

% by mass of nitrogen in metal nitride $= \frac{28}{3m+28} \times 100 = 28$ (Given)

$\Rightarrow 3m = \frac{72}{3} = 24 \text{ gm / mol}$

11.(0.4) 3.0g of salt of molecular weight 30g is present in 250 g solution

$\left[\begin{array}{l}\text{250 g water will make} \\ \text{250 ml solution} \\ d_{H_2O} = 1 \text{ gm / ml}\end{array}\right]$

$\Rightarrow \frac{3}{30} = 0.1$ mole solute is present in 0.25L solution.

Hence, molarity $= \frac{0.1}{0.25} = 0.4$ M

12.(D) $\underset{0.50 \text{ mole}}{3\,BaCl_2} + \underset{\substack{0.20 \text{ mole} \\ \text{(Limiting Reagent)}}}{2\,Na_3PO_4} \longrightarrow \underset{0.10 \text{ mole}}{Ba_3(PO_4)_2} + 6\,NaCl$

13. **(i) 37.92 (ii) 0.065 (iii) 7.73m**

Let us consider 1.0 L solution for all the calculation.

(i) Weight of 1 L solution = 1250 g

Weight of $Na_2S_2O_3 = 3 \times 158 = 474 g$

$\Rightarrow$ Weight percentage of $Na_2S_2O_3 = \frac{474}{1250} \times 100 = 37.92$

(ii) Weight of H_2O in 1 L solution $= 1250 - 474 = 776 g$

Mole fraction of $Na_2S_2O_3 = \frac{3}{3 + \frac{776}{18}} = 0.065$

(iii) Molality of $Na^+ = \frac{3 \times 2}{776} \times 1000 = 7.73 m$

14.(A) In one molal solution 1 mole of solute is dissolved in 1000 gm of solvent.

15.(D) The concentration terms which are associated with volume are temperature dependent.

$\therefore$ Molality is temperature independent.