Chemical stoichiometry

41. (b) $AgNO_3 \equiv 2Ag^+ + \underset{(H_2S)}{S^{2-}} \rightarrow Ag_2S$

∵2 mole →1 mole [100×1 =100 millimole]

∴100 miliimole →50 millimole H_2S required

$CuSO_4 \equiv Cu^{+2} + \underset{(H_2S)}{S^{2-}} \rightarrow CuS$

∵1 mole →1 mole [100×1=100 millimole]

∴100 millimole →100 millimole H_2S required

Ratio $\frac{50}{100} = \frac{1}{2}$.

42. (c) At room temperature $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

t =0	50*ml*	50*ml*	0
t =*t*	50 – 2*x*	50 – *x*	2*x*
	=0	25*gases*	(50)liquid

In this case $H_2$is limiting reagent

x = 25*ml*

At 110°*C* $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$ $V_{gas} = 75ml$

t =*t*	0	25*ml*	50*ml*

43. (c) $\overset{+2}{CuSO_4} + 2KI \rightarrow K_2SO_4 + \overset{+2}{CuI_2}$; $2\overset{+2}{CuI_2} \rightarrow \overset{+1}{CuI_2} + I_2$

$\boldsymbol{I_2 + 2Na_2S_2O_3 \rightarrow 2NaI + Na_2S_4O_6}$

Eq. wt. Of $\boldsymbol{CuSO_4.5H_2O}$ = **Mol. wt.** = **250**

100 *ml* of 0.1 *N* hypo ≡ 100 *ml* of 0.1 *N* $CuSO_4.5H_2O$

$= \frac{250\times0.1\times100}{100} = 2.5gm$

44. (d) $\boldsymbol{HNO_3 + KOH \rightarrow KNO_3 + H_2O}$

$\frac{12.6}{63}$ =0.2 mole; $HNO_3 \equiv KOH$

0.2 mole ≡0.2 mole

$0.2 \times 56 = 11.2gm.$

45. (a) Isobutane and *n*-butane $[C_4H_{10}]$ have same molecular formula;

$C_4H_{10} + \frac{13}{2}O_2 \rightarrow 4CO_2 + 5H_2O$

For 58*gm* of C_4H_{10} 208 *gm* O_2 is required then for 5 *kg* of C_4H_{10} $O_2 = \frac{5\times208}{58}$

$= 17.9kg$

46. (b) $n = \frac{16.8}{22.4} = 0.75$mole of $H_2$and O_2

$$\mathbf{2H_2O \rightarrow \underset{2:1}{2H_2 + O_2}} \begin{matrix} \mathbf{0.75} \\ \mathbf{0.25} \\ \mathbf{0.25} \end{matrix} \begin{matrix} \\ \mathbf{O_2} \\ \mathbf{H_2} \end{matrix}$$

2 mole H_2 – 2 moleH_2O

0.5 moleH_2 – 0.5 mole H_2O = 9*gm*.

47. (a) ∵ 3*ml* (*O*) →1*ml* O_3

30*ml* (*O*)→10*ml*O_3

$x = \frac{150\times10}{100} = 15ml$

V of O_2 +*V* of $O_3 = 135 + 10 = 145ml$

Turpentine oil absorb ozone.

48. (a) 50% *HCl* itself means 50*gm HCl* react with 100*gm* sample

% Purity $= \frac{50}{100} \times 100 = 50\%$.

49. (a) $AgNO_3 + HCl \rightarrow AgCl + HNO_3$

$\frac{30}{170}$ $\frac{500\times0.2}{1000}$

t =0 0.176 mole 0.1 mole limiting =14.345gm

t =t 0.076 mole 0 0.1mole

50. (d) $KMnO_4$ $FeSO_4$

$\frac{M_1V_1}{n_1}=\frac{M_2V_2}{n_2}$; $M_1V_1=\frac{n_1}{n_2}M_2V_2$

$=\frac{2}{10}\times 10\times\frac{1}{10}=\frac{1}{5}=0.2$

For (d), $M_1V_1=0.02\times 10=\frac{1}{5}$

51. (c) $\underset{1\text{mol.}}{ROH}+CH_3MgI\rightarrow \underset{1\text{ mol}=22400cc}{CH_4}+Mg$ OR I

1.12 mL is obtained from 4.12 mg

$\therefore$ 22400 mL will be obtained from

$\frac{4.12}{1.12}\times 22400mg=84.2g$

52. (b)

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

Simplest formula $=X_2Y$

53. (a) $A_3(BC_4)_2=3\times 2+[5+(-2\times 4)]_2=0.$

54. (b) $\underset{10gm}{CaCO_3}\rightarrow CaO+CO_2$

90% pure 9gm $=\frac{9}{100}$mole

$CaCO_3 \equiv CO_2 = 0.09$mole

At NTP Vol.$CO_2 = 0.09 \times 22.4 = 2.016L$.

55. (b) $Cd^{+2} + S^{2-} \rightarrow CdS$

20×1= 20

$Cu^{+2} + S^{2-} \rightarrow CuS$

20×0.5 =10

Ratio =2: 1

56. (b) $Mg^{+2} \equiv H_2$

$\boldsymbol{n = \frac{12gm}{24gm}} = \frac{1}{2}$mole of H_2

57. (a) $\underset{1\text{mole}}{Mg} + \underset{0.5\text{mole}}{\frac{1}{2}O_2} \rightarrow MgO$

0.5 mole of oxygen react with 1 mole of *Mg*

1.5 mole of oxygen react with $\frac{1.5}{0.5} = 3$mole

$24 \times 3 = 72gm.$

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

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