Mole Concept & Stoichiometry

Solved examples

Page.7
Q 5)

$$\underset{0.54\,g}{4X} + 3O_2 \longrightarrow \underset{1.02\,g}{2X_2O_3}$$

$n_{X_2O_3} = \dfrac{1.02}{2y+48}$

$n_X = \dfrac{0.54}{\text{M.w.} = ?}$

$\dfrac{0.54}{y} = \dfrac{2\times1.02}{2y+48}$

$n_X = \dfrac{2\times1.02}{2y+48}$

moles of X on LHS

$\Rightarrow \quad 1.08y + 48\times0.54 = 2.04y$

$\Rightarrow \quad 48\times0.54 = (2.04-1.08)y$

$\Rightarrow \quad y = \dfrac{48\times0.54}{0.96} = 27$

$n_X = \dfrac{0.54}{27} = 0.02$

$4X + 3O_2 \longrightarrow 2X_2O_3$

4 mol of X $\rightarrow$ 2 mol X_2O_3

$\dfrac{0.54}{y} \longrightarrow \dfrac{0.54}{y}\times\dfrac{1}{2}$ mol X_2O_3

$$\frac{1.02}{2y+48}$$

page 1 NO_2 N_2O CO_2 C_3H_8

① 46 44 44 44

$N = 14$

$\frac{112}{22400} = \frac{0.22}{MW}$, $MW = 44$

(B) (C) (D)

14/32

② $S = 32$, $He = 4$, $N = 14$

(A) $n_{O_2} = \frac{1}{32}$, $n_{SO_2} = \frac{2}{64}$

(B) $n_{CO_2} = \frac{1}{44}$, $n_{N_2O} = \frac{1}{44}$

(C) $n_{O_2} = \frac{112}{22400} \Rightarrow n_{He} = \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{1 \times V}{273} = \frac{0.5 \times 224}{273}$

$V = 112$

$n_{He} = \frac{112}{22400}$

(D) $n_{O_2} = \frac{1}{32}$, $n_{O_3} = \frac{1}{48}$

Page 11 Section A

18) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

Base — acidic gas — Salt — water

$n = M \times V$

$= 0.5 \times 50$ (÷1000)

$= 25$ m moles

1 mmol $= 10^{-3}$ mol

$n_{CaCO_3} = 25 \times 10^{-3}$

mass $= 25 \times 10^{-3} \times 100$

$= 2.5$ g

(19) L.R.

$3BaCl_2 + 2Na_3PO_4 \rightarrow Ba_3(PO_4)_2 + 6NaCl$

0.6 0.2 → 0.1

~~L.R.~~

3 → 2

0.6 → $0.6 \times \frac{2}{3} = 0.4$

(22) $Cu^{2+} + H_2S \rightarrow CuS\downarrow + H_2$

6.35g 63.5 32

$\frac{6.35}{63.5} \times 34 = 3.4\ g$

for 63.5 g Cu → 32 g S

6.35 g Cu → ? S = $\frac{6.35 \times 32}{63.5 \times 10} = 3.2\ g\ S$

H_2S

2g H 32g

32g S → 2g H

3.2g → $\frac{3.2 \times 2}{32} = 0.2$

$H_2S = 3.4\ g$

(24) $Ag^{+}\ CO_3^{-2}$

$Ag_2CO_3 \xrightarrow{\Delta} Ag_2O + CO_2\uparrow$

$Ag_2O \xrightarrow{\Delta} 2Ag + \frac{1}{2}O_2$

0.02

$n = \frac{2.76}{276} = 0.01$ 0.01

1 × 232

mass Ag = 0.02 × 108 = 2.16 g

(25) $3O_2 \rightarrow 2O_3$ $3O_2 \rightarrow 2O_3$

$n = \frac{67.2}{22.4}$ $\frac{67.2}{22.4} \times \frac{15}{100} O_2 \rightarrow$

$n_{actual} = \frac{67.2}{22.4} \times \frac{15}{100}$ $= \frac{67.2}{22.4} \times \frac{15}{100} \times \frac{2}{3}$

mass of O_3 = ~~~~ $\times 48$

$= 0.3 \times 48$

$= 14.4\ g$

(26) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

$18\ g / 18$

n 1

$4\ H_2O \rightarrow 3\ Fe$

$1\ H_2O \rightarrow \frac{3}{4}\ Fe$

$\frac{3}{4} \times 56 = 42\ g$

(27) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

$10\ g$ $1120\ cm^3$

$1\ cm^3 = 1\ ml$

$n = \frac{1120}{22400}$

$= 0.05$

$n_{CaCO_3} = 0.05$

mass $CaCO_3 = 0.05 \times 100 = 5\ g$

% $CaCO_3 = \frac{5}{10} \times 100 = 50\ \%$

Section B

31.) $N_2 \longrightarrow N$

2.8 g — 0.06

$N_2 \rightarrow 2N$

0.03 moles — 0.06

$n = \frac{2.8}{28}$

$= 0.1 - \underbrace{\frac{30}{100} \times 0.1}_{= 0.03}$

dissociated into atoms

n_{N_2} left $= 0.1 - 0.03$

$= 0.07$

Total no. of moles $= 0.07 + 0.06$

$= 0.13$ (A)

No. of N_2 molecules left $= 0.07 \times 6.022 \times 10^{23}$

~~$= 0.0421 5 4$~~

$= .42154 \times 10^{23}$ (B)

(32) at STP one mole air $=$ 22400 cm^3

mass $=$ density $\times$ volume

mass of one mole air $= 0.001293 \times 22400$

$= 28.96$ (M.w.)

$2 \times VD = MW$

$VD = \frac{28.96}{2} = 14.48$

(37) $m \rightarrow$ molality

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

0.8 mol H_2O + 0.2 mol NaCl

$$m = \frac{0.2}{0.8 \times 18/1000} = 13.9\ m$$

(38)

	E.R.	LR		
	$Ca(NO_3)_2$ +	$Na_2C_2O_4$ →	CaC_2O_4 +	$2NaNO_3$
	6 m mole	3 m mol		
	-3	-3	3	6
	3×10^{-3}	0	3×10^{-3}	6×10^{-3}

A/R

A →

R →

(A) Both ~~statements~~ Assertion & Reason are correct and reason is the correct explanation of Assertion

(B) Both A & R are correct but reason is not the correct explanation of A

(C) If A is true but R is false

(D) If A is false but R is true

(E) Both A & R are false

Section C

(42) relative atomic mass of B

$$= \frac{10 \times 19 + 11 \times 81}{100} = 10.81$$

(A)

(41) $n_{N_2} = \frac{0.28}{28} = 0.01 = n_{gas} = \frac{0.44}{MW}$

$\Rightarrow MW = 44$

(B)

(43) ~~NH_3~~ $NH_2CONH_2 \longrightarrow$ Urea

N_2CO1H_4 $\%N = \frac{28}{28+12+16+4} \times 100$

$= 46.6\%$