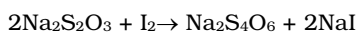
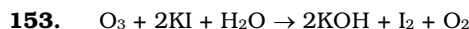


<b>Daily Tutorial Sheet-14</b>	<b>Level-3</b>
--------------------------------	----------------



$$\begin{aligned} \text{Millimoles of O}_3 &= \text{Millimoles of I}_2 = \frac{1}{2} \times \text{Millimoles of Na}_2\text{S}_2\text{O}_3 \\ &= \frac{1}{2} \times 40 \times 1/10 = 2 \text{ millimoles} = 0.002 \text{ moles} \end{aligned}$$

Total moles of  $\text{O}_3$  and  $\text{O}_2$  in the mixture:  $PV = n RT$

$$1 \times 1 = n \times 0.0821 \times 273$$

$$\therefore n = 0.044$$

Moles of  $\text{O}_2 = 0.044 - 0.002 = 0.042$

$$W_{\text{O}_2} = 0.042 \times 32 \text{ g} = 1.344 \text{ g}$$

$$W_{\text{O}_3} = 0.002 \times 48 \text{ g} = 0.096 \text{ g}$$

$$\therefore \% \text{ of O}_3 = \frac{0.096}{1.144} \times 100 = 6.7\%$$

No. of photons required for decomposition of ozone molecules  $= 0.002 \times 6.023 \times 10^{23} = 1.2 \times 10^{21}$

**154.**  $\text{Equivalents of dichromate initially} = \frac{1.25 \times 6 \times 100}{1000} = 0.75$

$$\text{Equivalents of Fe}^{2+} \text{ in 25 ml} = \frac{0.875 \times 5 \times 20}{1000} = 0.0875$$

$$\text{Equivalents of Fe}^{2+} \text{ in 50 ml} = 0.0875 \times 2 = 0.175$$

$$\text{Equivalents of excess dichromate} = 0.175$$

$$\therefore \text{Equivalents of dichromate consumed by (CuS and Cu}_2\text{S)} = 0.75 - 0.175 = 0.575$$

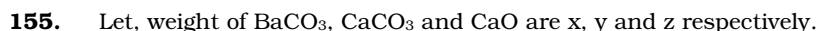
If  $x$  g is the mass of CuS, the mass of  $\text{Cu}_2\text{S}$  is  $(10 - x)$  g

$$\frac{x}{95.5} \times 6 + \frac{(10 - x)}{159} \times 8 = 0.575$$

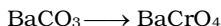
$$\therefore x = 5.74 \text{ gm}$$

$$\% \text{ CuS} = \frac{5.74}{10} \times 100 = 57.4\%$$

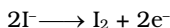
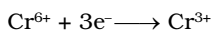
$$\% \text{ Cu}_2\text{S} = 42.6\%$$



$$\therefore x + y + z = 1.249$$



Redox change



$$\text{Meq. of BaCO}_3 = \text{Meq. of BaCrO}_4 = \text{Meq. of I}_2$$

$$\therefore \frac{x}{197/3} \times 1000 = 20 \times 0.05 \times \frac{100}{10}$$

$$\therefore x = 0.657 \text{ gm} \quad \dots (1)$$

The equivalent weight of  $\text{BaCrO}_4$  is  $M/3$ , therefore for  $\text{BaCO}_3$ , it should be  $M/3$  also because mole ratio of  $\text{BaCO}_3$  and  $\text{BaCrO}_4$  is 1 : 1.

Applying POAC for C atom,

$$\text{Moles of C in BaCO}_3 + \text{Moles of C in CaCO}_3 = \text{Moles of C in CO}_2$$

$$\therefore \frac{x}{197} + \frac{y}{100} = \frac{168}{22400}$$

$$\Rightarrow 200x + 294y = 295.5 \quad \dots (2)$$

From equation (1) and (2)

$$y = 0.416 \text{ gm}$$

$$\therefore 0.0657 + 0.416 + z = 1.249$$

$$z = 0.176$$

$$\% \text{ of CaO} = \frac{0.176}{1.249} = 14.09\%$$

- 156.** The chemical reaction is,  $\text{H}_2\text{O} + \text{KI} + \text{O}_3 \longrightarrow \text{I}_2 + \text{O}_2 + \text{KOH}$   
Milliequivalents of iodine = Milliequivalents of KI = Milli equivalents of  $\text{O}_3$  reacted  
Milliequivalents of  $\text{Na}_2\text{S}_2\text{O}_3 = 1.5 \times 0.01 = 1.5 \times 10^{-2}$

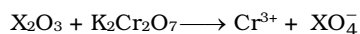
$$\text{Millimoles of iodine} = \frac{1.5 \times 10^{-2}}{2} = 7.5 \times 10^{-3} \quad [\because \text{n-factor for iodine} = 2]$$

$$\text{Millimoles of ozone} = 7.5 \times 10^{-3}$$

$$\text{Volume of ozone} = \frac{nRT}{P} = \frac{7.5 \times 10^{-6} \times 0.0821 \times 300}{1} = 184.725 \times 10^{-6} \text{ litre}$$

$$\text{Volume per cent of ozone} = \frac{184.725 \times 10^{-6}}{10} \times 100 = 1.847 \times 10^{-3}$$

- 157.**  $\text{XO} + \text{K}_2\text{Cr}_2\text{O}_7 \longrightarrow \text{Cr}^{3+} + \text{XO}_4^-$



Let, wt. of XO in the mixture be x g

Equivalent of  $\text{K}_2\text{Cr}_2\text{O}_7$  consumed by the mixture =  $0.015 \times 6$

$$\text{Equivalents of XO} = \frac{x}{x+16} \times 5$$

$$\text{Equivalents of X}_2\text{O}_3 = \frac{2.18-x}{2x+48} \times 8$$

$$\therefore \frac{x}{x+16} \times 5 + \frac{2.18-x}{2x+48} \times 8 = 0.015 \times 6$$

Since 1 mole of XO gives 1 mole  $\text{XO}_4^-$  and 1 mole of  $\text{X}_2\text{O}_3$  gives 2 moles of  $\text{XO}_4^-$ ,

$$\therefore \frac{x}{x+16} + \frac{2x(2.18-x)}{2x+48} = 0.0187$$

On solving,  $x = 99$

- 158.** Moles of  $\text{KIO}_3 = \frac{0.1}{214} = 0.00047$

$$\therefore \text{Moles of I}_2 \text{ liberated from KIO}_3 = \frac{0.00047}{2} = 0.000235$$

Moles of KI reacting =  $0.00047 \times 5 = 0.00235$  ( $\because$  n-factor for  $\text{KIO}_3$  and KI are 5 and 1 respectively)

$$\text{Moles of I}_2 \text{ produced from KI} = \frac{0.00235}{2} = 0.001175$$

Total moles of  $\text{I}_2$  produced and reacted =  $0.000235 + 0.001175 = 0.00141$  equivalents of  $\text{I}_2$  reacted  
=  $0.00141 \times 2 = 0.00282$  = equivalents of thiosulphate Solution:

$$\text{Molarity} = \frac{0.00282 \times 1000}{V} = 0.063 \text{ M (For thiosulphate n-factor} = 1)$$

$$(V = 45 \text{ mL})$$