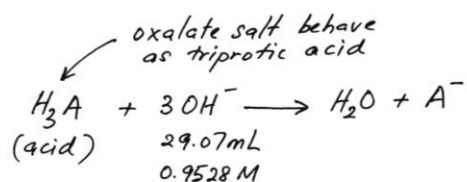
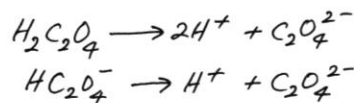
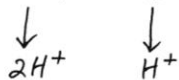


Sem 1 (2004/2005) : Stoichiometry

Q₁ (a) oxalate salt : $H_2C_2O_4 \cdot KHC_2O_4 \cdot xH_2O$ This salt behave as triprotic acid



$$n_{H_3A} = \frac{1}{3} \times n_{OH^-} = \left(\frac{1}{3} \times \frac{29.07 \times 0.9528}{1000} \right) \text{ mol}$$

$$\text{atau} \quad \frac{2.3463}{M_r} = \frac{29.07 \times 0.9528}{3 \times 1000}$$

$$\therefore M_r (\text{oxalate salt}) = 254.13$$

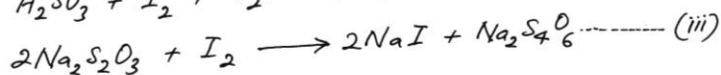
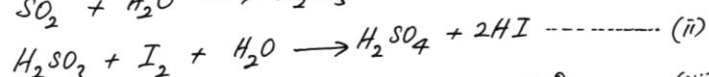
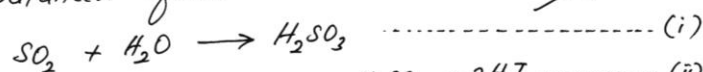
$$\begin{array}{l} M_r (H_2C_2O_4 \cdot KHC_2O_4) \\ = 218.16 \end{array}$$

$$218.16 + 18.0152x = 254.13$$

$$x = 2 \text{ (Ans)}$$

oxalate salt formula : $H_2C_2O_4 \cdot KHC_2O_4 \cdot 2H_2O$

Q₁ (b) Balanced equations



$$n_{I_2} (\text{added}) = \left(\frac{25.0 \times 0.0500}{1000} \right) \text{ mol} = 1.25 \times 10^{-3} \text{ mol}$$

$$\begin{aligned} n_{S_2O_3^{2-}} (\text{react with excess } I_2) &= \left(\frac{17.25 \times 0.09855}{1000} \right) \text{ mol} \\ &= 1.70 \times 10^{-3} \text{ mol} \end{aligned}$$

$$\begin{aligned} n_{I_2} (\text{excess}) &= \frac{1}{2} \times n_{S_2O_3^{2-}} \\ &= \left(\frac{1}{2} \times 1.70 \times 10^{-3} \right) \text{ mol} \\ &= 8.5 \times 10^{-4} \text{ mol} \end{aligned}$$

$\left(\frac{1}{2} \right)$

Sem I (2004/2005): Stoichiometry

Q₁ (b) cont.

$$n_{I_2} (\text{reacted with } SO_2) = (1.25 \times 10^{-3}) - (8.5 \times 10^{-4}) \text{ mol} \\ = 4.0 \times 10^{-4} \text{ mol}$$

From equation (i) and (ii)

$$n_{I_2} \equiv n_{SO_3^{2-}} \equiv n_{SO_2}$$

$$n_{SO_2} (\text{in 25 mL diluted solution}) = 4.0 \times 10^{-4} \text{ mol}$$

$$n_{SO_2} (\text{in 1 L}) = (4.0 \times 10^{-4}) \times \frac{1000}{25} \text{ mol} \\ = 0.016 \text{ mol}$$

∴ 25.0 mL saturated solution contains 0.016 mol SO_2

$$\text{Concentration of } SO_2, [SO_2] = \left(\frac{1000}{25.0} \times 0.016\right) \text{ mol dm}^{-3} \\ = 0.64 \text{ mol dm}^{-3}$$

ajh

$$= (0.64 \times 64.0638) \text{ g dm}^{-3} \\ = 41.0 \text{ g dm}^{-3} \text{ (Ans)}$$

Oxidation number of sulfur in H_2SO_3 , H_2SO_4 , $Na_2S_2O_3$, $Na_2S_4O_6$

$$H_2\underline{S}O_3 : +2 + x + 3(-2) = 0 \quad x = 6 - 2 = +4 \text{ (Ans)}$$

$$H_2\underline{S}O_4 : +2 + x + 4(-2) = 0 \quad x = 8 - 2 = +6 \text{ (Ans)}$$

$$Na_2\underline{S}_2O_3 : 2(+1) + 2x + 3(-2) = 0 \quad x = +2 \text{ (Ans)}$$

$$Na_2\underline{S}_4O_6 : 2(+1) + 4x + 6(-2) = 0 \quad x = +2.5 \text{ (Ans)}$$

2/2