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Exp. 5: Estimation of copper (Cu) contained in a supplied solution of copper salt by Iodometric method.

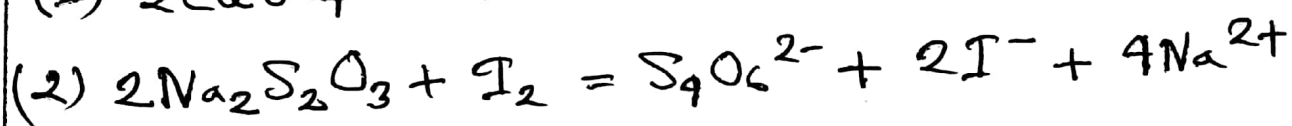
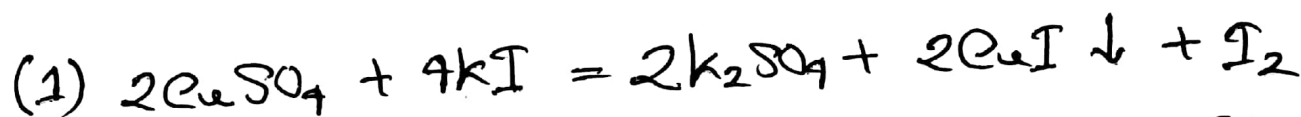
Method: Oxidation-Reduction titration.

Experimental Data:

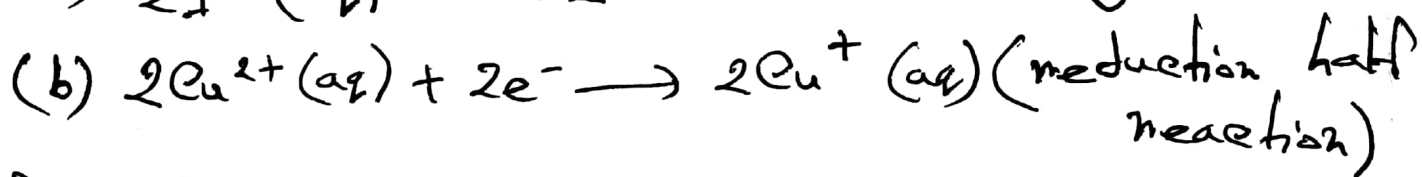
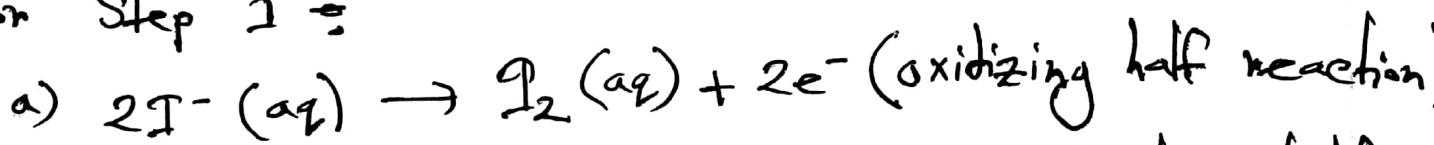
(A) Standardize sodium thiosulphate solution as

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The reaction takes place in two steps:



for Step 1:



for Step 2:

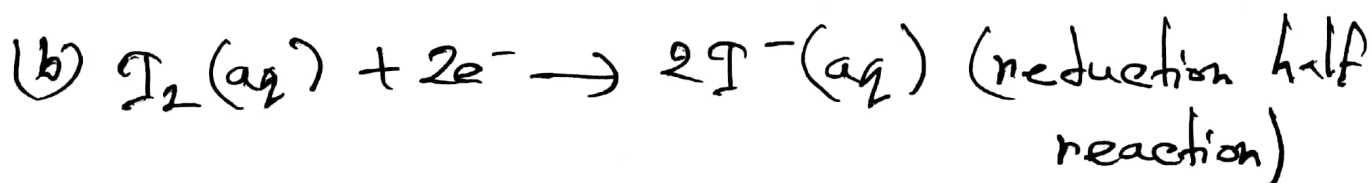
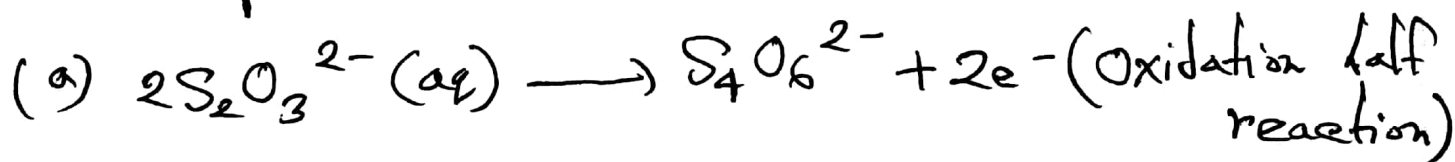


Table - 1 : Standardization of supplied  $\text{Na}_2\text{S}_2\text{O}_3$  solution against standard  $\text{K}_2\text{Cr}_2\text{O}_7$  solution by oxidation-reduction titration.

No of reading	Vol. of $\text{K}_2\text{Cr}_2\text{O}_7$ (in mL)	Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (burette reading) (in mL)			Mean (in mL)
		Initial	Final	Difference	
1	10	0.00	10.30	10.30	10.25
2	10	10.30	20.50	10.20	

Weight taken (in gm) = 0.666 g

The strength of  $\text{K}_2\text{Cr}_2\text{O}_7$  solution

$$= \frac{0.66 \times 0.1}{0.49} \text{ N}$$

$$= 0.066 \text{ N}$$

$$= 0.07 \text{ N}$$

The strength of supplied  $\text{Na}_2\text{S}_2\text{O}_3$  solution (S):

$$V_{\text{thio}} \times N_{\text{thio}} = V_{\text{dichromate}} \times N_{\text{dichromate}}$$

$$\Rightarrow 10.25 \times N_{\text{thio}} = 10 \times 0.07$$

$$\Rightarrow N_{\text{thio}} = \frac{10 \times 0.07}{10.25} \text{ N.}$$

$$= 0.0682 \text{ N}$$

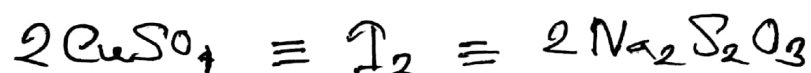
$$= 0.07 \text{ N.}$$

(B) Estimation of  $\text{Cu}^{2+}$  ions :

Table-2 : Determination of the amount of copper in a supplied solution of blue vitriol by iodometric method.

No. of reading	Vol. of Copper salt solution (in mL)	Vol of $\text{Na}_2\text{S}_2\text{O}_3$ (burette reading) (in mL)			Mean (in mL) (V)
		Initial	Final	Difference	
1	10	0.00	3.50	3.5	3.38
2	10	3.50	6.80	3.3	
3	10	6.80	10.20	3.4	
4	10	10.20	13.55	3.35	

Calculation :



$$1\text{ mL } 1\text{ N } \text{Na}_2\text{S}_2\text{O}_3 \equiv 0.06354\text{ gm of } \text{Cu}^{2+}$$

Amount of copper ions in 10 mL of copper salt Solution =  $0.06354 \times V \times S_{\text{gm}}$

$$= 0.06354 \times 3.38 \times 0.07$$

$$= 0.0150\text{ gm}$$

$$= 0.02\text{ gm}$$

Amount of copper ions in 500 mL of copper salt solution

$$= 0.06354 \times V \times 5 \times 50 \text{ gm}$$

$$= 0.06354 \times 3.38 \times 100 \times 50$$

$$= \cancel{7.5267 \text{ gm}} = 7.52 \text{ gm} \cdot 0.7516$$

$$= 0.75 \text{ gm}$$

Observed value of  $\text{Cu}^{2+}$  (in 500 mL)

$$= \cancel{7.52 \text{ gm}} \cdot 0.75 \text{ gm}$$

Known value of  $\text{Cu}^{2+}$  (in 500 mL)

$$= \frac{63.54 \times 5.70}{249.68} \text{ gm}$$

$$= 1.4505 \text{ gm} = 1.45 \text{ gm}$$

Results:

The amount of copper ions in 500 mL of copper salt solution is

Percentage of error:

$$\frac{\text{known value} - \text{Observed value}}{\text{known value}} \times 100$$

$$= \frac{1.45 - \cancel{7.52} 0.75}{1.45} \times 100$$

$$= 0.75 \quad 0.4827$$

$$= \cancel{45\%} = 48\%$$