Experiment No. 4

Object: Estimation of Oxalic acid by using standard $KMnO_4$ solution.

Theory: In acidic medium, KMnO4 is strong oxidizing agent. It oxidizes oxalic acid into CO_2.

$$2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 10CO_2 + 8H_2O$$

OR

$$2[MnO_4]^- + [C_2O_4]^{-2} + 16H^+ \longrightarrow 2Mn^{+2} + 8H_2O + 10CO_2$$

Chemical required: N/30 $H_2C_2O_4$, N/30 $KMnO_4$, unknown $H_2C_2O_4$ solution and 2N H_2SO_4.

Apparatus required: Conical flask, burette, pipette, beaker and funnel.

Procedure:

(a) Fill burette with $KMnO_4$solution. Note the initial reading. Pipet out 25 ml of standard fresh known oxalic acid solution in a clean conical flask and add to it 5 ml of 2N H_2SO_4. Run $KMnO_4$ in solution from the burette till the color of the solution becomes light pink which indicates the end point.

(b) Same procedure is also performed with the unknown solution of oxalic acid.

Note: Both the procedures (a+b) are repeated three times for getting concordant reading.

Observation:

(A) Titration with known solution of Oxalic acid.

S.No.	Vol. of $H_2C_2O_4$ used (ml)	Burette reading (ml)			Vol. of $KMnO_4$ used (ml) V_1 C.R
		Initial	Final	Difference	
1. 2. 3.	25 25 25	0.0 ------- ------	... ...	------	

(B) Titration with unknown solution of Oxalic acid.

S.No.	Vol. of $H_2C_2O_4$ used (ml)	Burette reading (ml)			Vol. of $KMnO_4$ used (ml) V_2 C.R
		Initial	Final	Difference	
1. 2. 3.	25 25 25	0.0 ---- -----	... ...	------	

Calculation: Suppose the volumes of $KMnO_4$with known and unknown Oxalic acid solutions are V_1 and V_2. The normality of unknown $H_2C_2O_4$ soln. is N.

$$N_1V_1 = N_2V_2$$

$$N_{KMnO4}V_{KMnO4} = N_{KNOWN\ O.A}\ V_{KNOWN\ O.A}$$

$$N_{KMnO4} = \frac{1 \times 25}{30 \times V_1}$$

$$N_{unknown\ O.A}\ V_{unknown\ O.A} = N_{KMnO4}V_{KMnO4}$$

$$N_{unknown\ O.A} = \frac{1 \times 25 \times V_2}{30 \times V_1 \times 25}$$

Equiv. Weight of oxalic acid = 37 gm. equivalent

$$N = \frac{V_2 \times 37}{30 \times V_1} \text{ gm/litre}$$

Result: The strength of unknown oxalic acid solution is ------------gm/litre.

Precautions: