

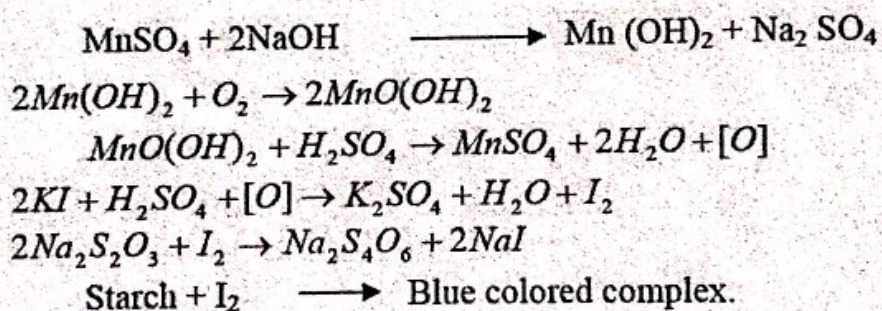
## Estimation of Dissolved Oxygen by Winkler's Method

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Expt No. 03

REG. NO. 17BIT0028

**Principle:** Dissolved oxygen is an important factor in corrosion. Oxygen is poorly soluble in water. The solubility of oxygen decreases with increase in conc. of the salt under a pressure of one atmosphere, the solubility is less in saline water. The estimation of dissolved oxygen in water is useful in studying corrosion effect of boiler feed water and in studying water pollution. *Dissolved oxygen* is usually determined by Winkler's method. It is based on the fact that dissolved oxygen oxidized potassium iodide (KI) to iodine. The liberated iodine is titrated against standard sodium thiosulphate solution using starch indicator. Since dissolved oxygen in water is in molecular state. It as such cannot oxidize KI. Hence Manganese Hydroxide is used as an oxygen carrier to bring about the reaction between KI and Oxygen. Manganese hydroxide, in turn, is obtained by the action of NaOH on  $MnSO_4$ .



The liberated iodine ( $I_2$ ) is titrated against standard sodium thiosulphate ( $Na_2S_2O_3$ ) solution using starch as indicator.

### OBSERVATION AND CALCULATIONS

Titration I :

#### STANDARDIZATION OF SODIUM THIOSULPHATE

S. No.	Volume of $K_2Cr_2O_7$ (mL)	Burette reading (mL)		Volume of sodium thiosulphate ( $V_1$ , mL)
		Initial	Final	
1	20	0	17.6	17.6
2	20	0	17.6	17.6
Concordant value				17.6



### Calculations:

Volume of potassium dichromate  $V_1 = 20 \text{ mL}$

Strength of potassium dichromate  $N_1 = 0.01 \text{ N}$

Volume of sodium thiosulphate  $V_2 = 17.6$

Strength of sodium thiosulphate  $N_2 = 0.01 \text{ N}$

$$V_1 N_1 = V_2 N_2$$

$$N_2 = V_1 N_1 / V_2$$

Strength of sodium thiosulphate =  $N_2 = 0.01 \text{ N}$

### Titration: II

Estimation of dissolved oxygen

S. No.	Volume of water sample ( $V_1$ , mL)	Burette reading (mL)		Volume of sodium thiosulphate ( $V_2$ , mL)
		Initial	Final	
1	100	0	8.5	8.5
2	100	0	8.5	8.5
3	100	0	8.5	8.5
Concordant value				8.5

### Calculations :

Volume of sodium thiosulphate  $V_2 = 8.5 \text{ mL}$

Strength of sodium thiosulphate  $N_2 = 0.01 \text{ N}$

Volume of water sample taken  $V_1 = 100 \text{ mL}$

Strength of given water sample  $N_1 =$

$$V_1 N_1 = V_2 N_2$$

$$N_1 = V_2 \times N_2 / V_1$$

$$= 8.5 \times 10^{-4} \text{ N}$$

Amount of dissolved oxygen (ppm) = normality  $\times$  equivalent weight of  $O_2 \times 1000 \text{ mg/L}$

of the given water sample.

$$= 8.5 \times 8 \times 1000 \text{ mg/L} \times 10^{-4}$$

$$= 6.8 \text{ ppm}$$

2.1.2m

8/8  
4/1/18

### Requirements:

**Reagents and solutions:** Standard buffer of pH 7, standard KCl solution of 0.01 M concentration, standard potassium dichromate of 0.01 N, sodium thiosulphate solution, potassium iodide solution, alkali iodide solution (KI + NaOH in water), conc.  $H_2SO_4$ , manganese sulphate, starch solution as indicator,.

**Apparatus:** Conical flask, Burette, Measuring flask, Beakers.

### TITRATION 1: STANDARDIZATION OF SODIUM THIOSULPHATE

The burette is washed and rinsed with sodium thiosulphate solution. Then the burette is filled with given sodium thiosulphate solution. 20 mL of 0.01N potassium dichromate solution is pipette out into a clean conical flask. To this 5 mL of sulphuric acid and 10 mL of 10% potassium iodide are added. This is titrated against sodium thiosulphate solution, when the solution become straw yellow colour, starch indicator is added and then the titration is continued. The end point is disappearance of bluish brown colour. The titration is further repeated twice or thrice to get the concordant value.

### TITRATION 2: ESTIMATION OF DISSOLVED OXYGEN

100 mL of water sample is taken in a conical flask, 2 mL of manganese sulphate and 2mL of alkali iodide solution are added and shaken well for the rough mixing of the reagents. The flask is left aside for few minutes to allow the precipitate to settle down and then 2mL of conc. Sulphuric acid is added for the complete dissolution of the precipitate. Then it is further titrated against standard sodium thiosulphate solution. When the solution becomes light yellow, starch indicator is added. The end point is disappearance of bluish brown colour. The titration is repeated twice or thrice to get the concordant value. From the titre value the strength of dissolved oxygen is calculated and hence the amount of dissolved oxygen in the water sample is calculated.

## Results:

Amount of dissolved oxygen in the given water sample = 6.8 ppm