

# INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY

COURSE CH117-L	ROLL NO. 23B0912	NAME Aditya Samayala
ASSIGNMENT NO. 7	DUE DATE	SUB. DATE 9.5 10

## Experiment-7: Complexometric Titration

### Aim:

To determine the total hardness of water using complexometric titration with ethylene diamine tetraacetic acid (edta).

### Part-1: Standardisation

Sample label = A

### Observation table

S.No.	Vol. of Sample (mL)	Vol. of edta (mL)
1.	10	9.8
2.	10	9.8
3.	10	9.9

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### Calculation

Molarity of  $\text{MgSO}_4$  sample = 0.02 M

Volume of  $\text{MgSO}_4$  sample = 10 mL

$$V = \text{Volume of edta solution} = \frac{V_1 + V_2 + V_3}{3} = \frac{9.8 + 9.8 + 9.9}{3}$$

$$V = 9.83 \text{ mL}$$

$$= \frac{29.5}{3} = 9.83 \text{ mL}$$

Therefore, molarity of edta solution is

$$M_1 V_1 = M_2 V_2 \quad M \times V = 0.02 \times 10$$

$$\Rightarrow M \times 9.83 = 0.02 \times 10$$

$$M = \frac{0.02 \times 10}{9.83}$$

$$M = 0.0203 \text{ M}$$

### Part-2: Estimation

Sample no = 150

Observation table

S.No	Vol. of Sample (mL)	Vol. of edta (mL)
1.	10	6.6
2.	10	6.8
3.	10	6.6 + 0.25

Calculation:

Molarity of edta =  $M_1 = 0.0203 \text{ M}$  (from standardisation)

$$\text{Volume of edta used} = V_1 = \frac{6.6 + 6.8 + 6.6}{3} = 6.667$$

$$V_1 = 6.667 \text{ mL}$$

Molarity of hard water =  $M_2$

Volume of hard water sample =  $V_2 = 10 \text{ mL}$

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$$M_1 V_1 = M_2 V_2$$

$$\Rightarrow 0.0203 \times 6.667 = M_2 \times 10$$

$$\Rightarrow M_2 = \frac{0.0203 \times 6.667}{10}$$

$$\boxed{M_2 = 0.0135} \text{ M}$$

$$M_2 = 0.0135 \text{ M}$$

in 100mL, there will be  $0.0135 \times 0.1 = 0.00135 \text{ g of } \text{CaCO}_3$ .

~~A1~~

$$\begin{aligned} \text{amt. of } \text{CaCO}_3 \text{ in 100mL of solution} &= 0.00135 \times 100 \\ &= 0.135 \text{ g of } \text{CaCO}_3 \text{ in} \\ &\quad 100 \text{ mL water} \end{aligned}$$

$$\text{degree of hardness} = \frac{0.135}{100} = 0.00135 \text{ g/mL.}$$

Result:

① Molarity of edta solution is  $M = 0.0203 \text{ M}$

② amount of  $\text{CaCO}_3$  present in 100 mL hard water

$m = 0.135 \text{ g in 100 mL}$

③ degree of hardness (in g/L) is

$DH = 0.00135 \text{ g/mL}$

= Concentration of  $\text{CaCO}_3$  in 100 mL water.