



### **The properties of EDTA :-**

- 1-Weak acid insoluble in water , there for the salt  $\text{Na}_2\text{H}_2\text{Y} \cdot 2\text{H}_2\text{O}$  used instead of it .
- 2-The abbreviation  $\text{H}_4\text{Y}$  ,  $\text{H}_3\text{Y}^{-1}$  ,  $\text{H}_2\text{Y}^{-2}$  ,  $\text{HY}^{-3}$  and  $\text{Y}^{-4}$  often refer to EDTA .
- 3- It has four acidic hydrogen and tow ion pair electrons ,so it is a chelate reagent .
- 4- The selectivity of EDTA is based on pH for each metal ion by using buffer solution .
- 5- The general reaction of EDTA with metal as :-



### **The Requirement Materials**

- 1- 0.1 M EDTA (known concentration) .
- 2- Tap water (unknown concentration) .
- 3- Buffer solution (10 , 12 )
- 4- Eriochrome black – T, Murex ide (indicators) .

### **Procedure :-**

#### **A- Determiration for total a permanent hardness in tap water :**

- 1- Put (10ml) from the boiling solution which contact the permanent hardness only into a conical flask ..
- 2- Add (1ml) of the buffer solution ( pH=10 ) .
- 3- Add (0.1- 0.2) gm or (3drops) of the Eriochrome black – T as an indicator .
- 4- Titrate against 0.01M EDTA solution until the color of the solution changes from red to blue .

5- Calculate the hardness permanent concentration as (ppm  $\text{CaCO}_3$ ) .

Not :  $\text{CaCO}_3$  represents the total hardness of tap water

$$M_1 V_{1(\text{EDTA})} = M_2 V_{2(\text{sample})}$$

$$V M_{(\text{EDTA})} = (\text{wt } \text{CaCO}_3 / \text{M.wt}) * 1000$$

$$\text{M.wt } \text{CaCO}_3 = 100$$

$$\text{ppm } \text{CaCO}_3 = (\text{wt } \text{CaCO}_3 / 50) * 10^6$$

### B- Determination of calcium in tap water :

- 1- Put (50ml) from the tap water (sample) into a conical flask ..
- 2- Add (1 ml) of the buffer solution ( pH=12) .
- 3- Add (0.1- 0.2) gm or (3drops) of the murex ide as an indicator .
- 4- Titrate against 0.01M EDTA solution until the color of the solution changes from pink to violet.
- 5- Calculate the calcium concentration as (ppm  $\text{Ca}^{+2}$ ) .

$$M_1 V_{1(\text{EDTA})} = M_2 V_{2(\text{sample})}$$

$$V M_{(\text{EDTA})} = (\text{wt of } \text{Ca}^{+2} / \text{A.wt}) * 1000$$

$$\text{A.wt } \text{Ca}^{+2} = 40$$

$$\text{ppm } \text{Ca}^{+2} = (\text{wt } \text{Ca}^{+2} / 50) * 10^6$$

### C - Determination of magnesium – Hardness :

$$V_{\text{EDTA, total}} - V_{\text{EDTA, Ca}^{2+}} = V_{\text{EDTA, Mg}^{2+}}$$

$$V_{\text{EDTA, Mg}^{2+}} * M_{\text{EDTA}} = (\text{wt. Mg}^{+2} / \text{At. wt}) * 100$$

$$\text{A.wt } \text{Mg}^{+2} = 24$$

$$\text{ppm } \text{Mg}^{+2} = (\text{wt. Mg}^{+2} / 50) * 10^6$$