

TITRATION I

Estimation of Total Hardness

Standard EDTA solution Vs Hard water sample

Indicator: EBT

S.No.	Volume of hardwater sample (ml)	Burette reading (ml)		Volume of EDTA solution consumed (ml)	Concordant value (V_1 ml)
		Initial	Final		
1	40	0			
2	40	0			

40 ml hard water sample consumed = V_1 ml EDTA

But, 1 ml EDTA = 1 mg CaCO_3

Therefore, V_1 ml EDTA = V_1 mg CaCO_3

i.e., 40 ml hard water sample = V_1 ml of EDTA = V_1 mg of CaCO_3

1000 ml hardwater sample = $\frac{V_1}{40} \times 1000 =$

Total Hardness of water sample = mg/L or ppm

NOTE: (INSTEAD OF V_1 YOU HAVE TO ENTER YOUR EXPERIMENTAL VALUE. SO, WHEN YOU WRITE IN RECORD DON'T WRITE V_1 NOW. AFTER COMPLETE THE EXPERIMENT WILL ENTER THE VALUE)

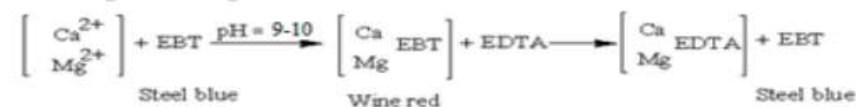
DETERMINATION OF TOTAL, TEMPORARY AND PERMANENT HARDNESS OF WATER BY EDTA METHOD

AIM

To estimate the amount of total, permanent and temporary hardness of the given sample of water by EDTA method. A standard solution of 0.01 M EDTA (1 ml = 1 mg of CaCO_3) is provided.

PRINCIPLE

EDTA is insoluble in water but its disodium salt is soluble in water. Hence its disodium salt is used. It forms complex with metallic ions. Eriochrome black - T (EBT) is an azo dye of steel blue colour (used as an indicator) and it forms a wine red colored weak complex with Mg^{2+} and Ca^{2+} ions of hard water at pH 9 to 10. When the sample water is buffered to a pH of 9 to 10 and by the addition of few drops of EBT, water colour turns into wine red as EBT forms complex with few Ca^{2+} and Mg^{2+} ions. Then it is titrated against EDTA taken in the burette. Now EDTA starts forming complex with all the Ca^{2+} and Mg^{2+} ions and finally it extracts metallic ions from unstable EBT complex also. Since EBT is left free in the water, the water colour turns into steel blue which indicates the end point of the titration. After determining total hardness, permanent hardness is estimated by boiling and filtering the sample water.



TITRATION-2

Estimation of Permanent Hardness

Standard EDTA solution Vs Boiled water sample

Indicator: EBT

S.No.	Volume of boiled hardwater sample (ml)	Burette reading (ml)		Volume of EDTA solution consumed (ml)	Concordant value (V ₁ , ml)
		Initial	Final		
1	40	0			
2	40	0			

MODEL CALCULATIONS

Volume of boiled water sample taken = 40 ml

40 ml of boiled water consumed = V₂ ml of EDTA = V₂ mg CaCO₃

1000 ml boiled water sample = $\frac{V_2}{40} \times 1000 =$

Permanent hardness of the given sample of water = mg/L or ppm

Temporary hardness of the given water sample = Total hardness - Permanent hardness

= ppm

NOTE: (INSTEAD OF V₂ YOU HAVE TO ENTER YOUR EXPERIMENTAL VALUE. So, WHEN YOU WRITE IN RECORD DON'T WRITE V₂ NOW. AFTER COMPLETE THE EXPERIMENT WILL ENTER THE VALUE)

SIMPLE PROCEDURE:

Solutions required	Titration I	Titration II
Burette Solution	EDTA solution	Std. EDTA solution
Pipette Solution	40ml of Hard water sample	40 ml of Boiled water sample
Additional Solution	5ml of Ammonia buffer solution	5ml of Ammonia buffer solution
Indicator	2-3 drops of EBT indicator	2-3 drops of EBT indicator
End Point (colour change)	Colour change from wine red to steel blue	Colour change from wine red to steel blue

RESULT:

1. Total hardness of the given water sample =
2. Permanent hardness of the given water sample =
3. Temporary hardness of the given water sample =