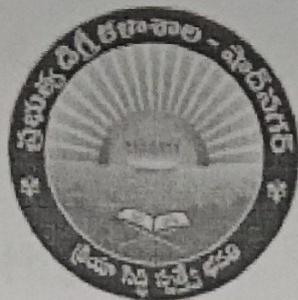


GOVERNMENT DEGREE COLLEGE, SHADNAGR
DEPARTMENT OF CHEMISTRY



A PROJECT WORK ON
WATER ANALYSIS

Submitted By

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GUIDED BY
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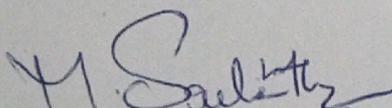
CERTIFICATE

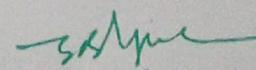
This is to certify that

- 1) BEGARI REVANTH BABU(18033067445501)
- 2) JITTA LATHA(18033067445513)
- 3) JAMBULA MOUNIKA(18033067445512)
- 4) GANDRATHI MANASA(18033067445510)

Have completed there project work on WATER ANALYSIS.

They have successfully prepare this project report in the chemistry laboratory
Of Government Degree College ,shadnagar.


Signature of the supervisor


signature of principal
PRINCIPAL
Govt. Degree College
Shadnagar.
Ganga Reddy Dist.

DECLARATION

We the following students studying B.Sc III year at Govt Degree College ,Shadnagar during the academic year 2020-21 here by declared that is our original project work On Water Analysis submitted under the guidance of DrM.Srilatha.

S.No	H.T.No	Student Name	signature
1	18033067445501	Begari Revanth babu	Revanth
2	18033067445513	Jitta Latha	Latha
3	18033067445512	Ambula Mounika	Mounika
4	18033067445510	Gandrathi Manasa	manasa.g

Introduction

Hardness of water :-

Water hardness is the traditional measure of the capacity water to precipitate soap. Hard water requiring considerable amount of soap to produce lather. Scaling of pipes, boilers and house hold appliances is due to hard water. Actually Hardness is caused by Ca and Mg ions. Hardness is commonly expressed as $CaCO_3$ in mg/L . The degree of Hardness of drinking water has been classified in terms of equivalent $CaCO_3$ concentration as follows

Soft	:	0 - 60 mg/L
Medium	:	60 - 120 mg/L
Hard	:	120 - 180 mg/L
Very Hard	:	> 180 mg/L

Hardness

Temporary

→ It is caused due to CO_3^{2-} and HCO_3^-

→ scaling of pipes is due to this Hardness

→ It is can removed by boiling

perminant

→ It is caused by SO_4^{2-} and Cl^-

→ It [could] can not be removed by boiling

II

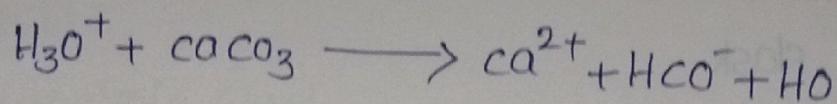
Alkalinity of water :=

→ Alkalinity of water is the measure of its capacity to neutralise the Acids.

→ Alkalinity of natural water is due to the salts of carbonates, Bicarbonates, Borates, silicones, and phosphates along with Hydroxide ions, in the free state.

→ But in natural water Alkalinity is caused by Hydroxide, carbonates, and bicarbonates.

→ The Bicarbonates of Ca and Mg results from the reaction of the Acidic water with Ca and Mg minerals such as calcite (CaCO_3), dolomite (Mg/CaCO_3) and Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)



→ Total Alkalinity is the total concentration of Bases in water expressed as ppm or mg/L of CaCO_3

→ The pH range of 6-8 is found to be the best for the most of fishes and insects in stream.

→ Bacteria began to die off below pH 5.5

→ The most common method of increasing the Alkalinity of water by adding Agricultural Lime stone (CaCO_3)

III conductivity:

→ Generally the water consist of many ions. like Ca^{2+} , Mg^{2+} , SO_4^{2-} , Borates, sulphates, carbonates, Bicarbonates and chlorides.

→ The to these ions generally water has conductivity.

I Determination of Hardness :-

used chemicals

- * Standard EDTA solution
- * Ammonical Buffer solution
- * Eriochrome Black-T Indicator

used Apparatus :-

- conical flask
- Beaker
- Burette
- stand
- glass rod

Total Hardness :-

- 1) Take 25ml of water sample in conical flask.
- 2) Add 1ml of buffer solution followed by Indicator.
- 3) Add a pinch of Eriochrome black-T and titrate against with standard EDTA 0.01N till wine red colour changes to blue.

Note the volume of EDTA required [V]

Boil the water and repeat the experiment to get concurrent readings.

II Determination of Alkalinity :-

used chemicals

- standard H_2SO_4 solution (0.02N)

→ phenolphthalein Indicator

→ methyl orange Indicator.

used Apparatus

→ conical flask

→ Beaker

→ Burette

→ Volumetric flask

→ Glass rod

procedure :=

- * Take 25ml of sample in conical flask and add 2-3 drops of phenolphthalein indicator.
- * pink colour develops and titrate against 0.02N H_2SO_4 till it disappears. note the volume of H_2SO_4 run down (A)
- * Add 2-3 drops of methyl orange to the same flask and continue the titration till pH come to h.s [orange] orange colour change to pink. note down the volume of H_2SO_4 run down (B)
- * continue the titration till we get concurrent readings.

$$P - \text{Alkalinity (mg/lit as CaCO}_3) = A \times 1000 / \text{volume of sample}$$

$$T - \text{Alkalinity (mg/lit as CaCO}_3) = B \times 1000 / \text{volume of sample}$$

sample - I

(i) Hardness of water before boiling :=

s.no	volume of water sample (ml)	Burette Readings		Volume of EDTA run down ml
		Initial	Final	
1.	25	0	16	16
2.	25	16	32	16
3.	25	0	17.2	17.2

$$\text{Total hardness in mg/lit} = \frac{\text{volume of EDTA} \times 1000}{\text{volume of water sample}}$$

$$= 16 \times 1000 / 25$$

$$= 640 \text{ mg/lit}$$

(ii) Hardness of water After Boiling :

S.No	Volume of water sample [ml]	Burette Readings		Volume of EDTA run down [ml]
		Initial	Final	
1.	25	0	8	8
2.	25	8	16.5	8.5
3	25	16.5	25	8.5

$$\text{Permanent Hardness in mg/Lit} = \frac{\text{Volume of EDTA consumed for boiled water} \times 1000}{\text{Volume of boiled water - } \delta \text{ sample}}$$

$$= \frac{8.5 \times 1000}{25}$$

$$= 340 \text{ mg/Lit}$$

II Determination of Alkalinity water

S.No	Volume of water sample [ml]	Burette Readings			Burette Reading		Volume of H ₂ SO ₄ run down [ml] [B]
		Initial	Final	Volume of H ₂ SO ₄ run down [ml]	Initial	Final	
1.	25	0	2.2	2.2	2.2	9.4	7.2
2.	25	0	2.2	2.2	2.2	9.4	7.2

a) The concentration of carbonate ion, in sample = $2.2 \times 10^{-2} / 25$

$$= 0.00176 M$$

The amount of carbonate ion = molarity \times molecular weight of CO_3^{2-}

$$= 0.00176 \times 60$$

$$= 0.1056 \text{ g/lit}$$

b) The concentrations of bicarbonate ion in sample =

$$= 7.8 \times 10^{-2} / 25$$

$$= 0.00576 M$$

The amount of Bicarbonate ion = molarity \times molecular weight of HCO_3^-

$$= 0.00576 \times 61$$

$$= 0.3516 \text{ g/lit}$$

Alkalinity :=

$$CO_3^{2-} = 0.1056 \text{ g/lit}$$

$$HCO_3^- = 0.3513 \text{ g/lit}$$

III Conductivity of water :- 5.6 m Ω

Result of sample :=

1) Permanent Hardness of water = 340 mg/lit

2) Total Hardness of water = 640 mg/lit

3) Alkalinity of water carbonate $[CO_3^{2-}] = 0.1056 \text{ g/lit}$
Bi carbonate $[HCO_3^-]$

u) conductivity of water = 0.3513 g/lit

$$= 5.6 m\Omega$$

The amount of Bicarbonate ion = molarity \times molecular weight of carbonate

$$= 0.00208 \times 61$$

$$= 0.12688 \text{ gr/lit}$$

$$= 0.0020 \text{ gr/lit}$$

$$\text{Alkalinity : } \text{CO}_3^{2-} = 0.0020 \text{ gr/lit}$$

$$\text{HCO}_3^- = 0.12688 \text{ gr/lit}$$

ii) Hardness of water After Boiling =

S.No	Volume of water sample (ml)	Burette Readings		Volume of EDTA run down (ml)
		Initial	Final	
1	50	0	6	6
2	50	6	12	6
3	50	12	18.6	6.6

Permanent Hardness in mg/lit = $\frac{\text{Volume of EDTA consumed for boiled water} \times 1000}{\text{Volume of water sample}}$

Volume of Boiled water sample

$$= 6 \times 1000 / 50$$

$$= 120 \text{ mg/lit}$$

conductivity of water :=

Result of sample :- 2

1. Permanent hardness of water = 120 mg/lit
2. Total Hardness of water = 124 mg/lit
3. Alkalinity of water carbonate [CO_3^{2-}] = 0.0024 g/lit
Bi carbonate [HCO_3^-] = 0.12688 g/lit
4. conductivity of water = 4.1 m μ

Sample - 2

Manjeera Water vs EDTA

i) Hardness of water before boiling :=

S.No	Volume of water sample (ml)	Burette Readings		Volume of EDTA run down (ml)
		Initial	Final	
1.	50	0	6.2	6.2
2.	50	6.2	12.4	6.2
3.	50	12.4	19.0	6.6

$$\text{Total Hardness in mg/lit} = \frac{\text{volume of EDTA} \times 1000}{\text{vol. of water sample}}$$

$$= 6.2 \times 1000 / 50$$

$$= 124 \text{ mg/lit}$$

Determination of Alkalinity of water
Hardness of water After boiling (fault)

S.No	Volume of sample [ml]	Burette Readings		Vol of H_2SO_4 run down [A] ml	Burette Reading		Vol of H_2SO_4 run down (B) ml
		Initial	Final		Initial	Final	
1.	50	0	0.9	0.9	0.9	6.1	5.2
2.	50	0	0.9	0.9	0.9	6.1	5.2

a) The concentration of carbonate ion in sample

$$= 0.9 \times 0.02 / 50$$

$$= 0.00036M$$

The amount of carbonate = molarity \times molecular weight of carbonate

$$= 0.00036 \times 60$$

$$= 0.0216 \text{ g/Lit}$$

b) The concentration of Bi carbonate ion in sample

$$= 5.2 \times 0.02 / 50$$

$$= 0.00208M$$

sample

i) Hardness of water before boiling :=

S.No	Volume of water sample [ml]	Burette Reading		Volume of EDTA run down [ml]
		Initial	Final	
1.	25	0	8	8
2.	25	0	6.6	6.6
3.	25	0	6.6	6.6

$$\text{Total Hardness in mg/Lit} = \frac{\text{Vol of EDTA} \times 1000}{\text{Vol of water sample}}$$

$$= \frac{6.6 \times 1000}{25}$$

$$= 2.64 \text{ mg/Lit}$$

ii) Hardness of water After boiling :=

S.No	Vol of water sample [ml]	Burette Readings		Volume of EDTA run down [ml]
		Initial	Final	
1.	25	0	0.5	0.5
2.	25	0.5	1.0	0.5

$$\text{Permanent Hardness in mg/Lit} = \frac{\text{Vol. of EDTA consumed for } \times 1000 \text{ boiled water}}{\text{Vol. of Boiled water sample}}$$

$$= \frac{0.5 \times 1000}{25}$$

$$= 20 \text{ mg/Lit}$$

no	Vol of sample [ml]	Burette readings		Bavol. of H_2SO_4 [ml] run down [A]	Burette Reading		Vol of H_2SO_4 run down [B] [ml]
		Initial	Final		Initial	Final	
1.	25	0	1.2	1.2	1.2	7.7	6.5
2.	25	0	1.2	1.2	1.2	7.7	6.5

a) The concentration of carbonate in sample $= \frac{1.2 \times 0.02}{25}$
 $= 0.00096M$

The amount of carbonate ion = molarity \times molecular weight of carbonate
 $= 0.00096 \times 66$

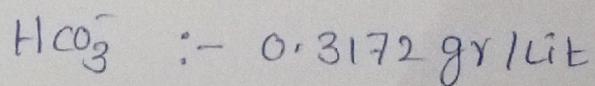
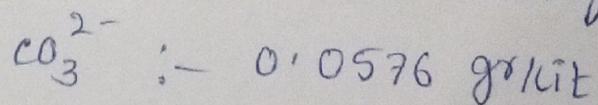
b) The concentration of Bicarbonate $= 0.0576 \text{ g/lit}$
 ion sample $= \frac{6.5 \times 0.02}{25}$
 $= 0.0052M$

The amount of Bicarbonate ion = molarity \times molecular weight of carbonate

$$= 0.0052 \times 61$$

$$= 0.3172 \text{ g/lit}$$

Alkalinity :-



conductivity of water :-

Result of sample :- 3

1. permanent Hardness of water = 20 mg/Lit
2. Total Hardness of water = 264 mg/Lit
3. Alkalinity of water carbonate $[CO_3^{2-}]$ = 0.0576 gr/Lit
Bi carbonate $[HCO_3^-]$ = 0.6172 gr/Lit
4. conductivity of water = 4.6 mm