-	Date 11.10.21
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	ESTIMATION OF TOTAL HARDNESS, PERMANENT AND
	TEMPORARY HARDNESS BY EDTA METHOD
*	AIM:
	To estimate the amount of total hardness, permanent
	hardness and temporary hardness of a given sample
	of water by EDTA method using ammonia buffer (pH=10) and epichiome black -T indicator.
_	(ph-10) and epichiome black (industry .
4	APPARATUS REQUIRED:
^	Burette, lipette, Conical Flask, Standard Volumetric Hask,
	Burette, lifette, Conical Flask, Standard Volumetric flask, furnel, Burner, Beaker 250 ml.
*	REAGENTS REQUIRED:
	EDTA Solution, Standard hard water, Sample water,
	EDTA Solution, Itandard hard water, sample water, Epichrome black-T indicator (EBT), NH3-NH4Cl buffer
	solution (pH=10).
+	PRINCIPLE:
7	Disodium salt of ethylene diamine tetra acetic acid
	Disodium salt of ethylene diamine tetra acetic acid (EDTA), is used to determine the total hardness of the
	given hard water.
+	Ethylene diamine tetra asetic acid is a tetra carboxylic
	acid which has the following formula:
	HOOC H2C CH2 COOH
-	
-	N-012-N
-	LIDOCH C CH (DOLA
+	HOOCH2C CH2COOF
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-7	The entire reaction between Ca, My word and EB-Til as follows: [Ca ²⁺] + EBT -> [Ca ²⁺ - EBT] [Inline Red (unstable)]
	[Ca ²⁺] + EBT -> [Ca ²⁺ - EBT] [Inline Red (unstable)] [Ward water sample)
	[Get EBT] + EDTA -> Cart EDTA] + EBT [Blue] [Mg21] (Stable colourless complex)
A	PROCEDURE:
W	Standardisation of EDTA:
-	Standardisation of EDTA: lipette out 20 ml of standard hard water into a clean
-7	Add 5 ml of the buffer solution and 3 or 4 drops of the Einschrome Black -T indicator.
	Einchrome Black - T'indicator.
-)	The solution Tuens were red in color. Titrate the wine
	red coloured solution against EDTA taken in the burette.
->	The change from wine red to steel blue colour is the end
- 3	point.
-/	Repeat the titration for concordant values. Let the titer value be V, ml.
The second second	Determination of total Hardness:
7	libette out 20 ml of the sample hand water it
	likette aut 20 ml of the sample hand water into a clean conical flack.
7	Add 5 ml of buffer solution and 3 or 4 drops Eio chrome Black - Tindicator.
	Black - Tindicator.
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	de la constantina della consta				
The change of wine red to steel blue is I Repeat the titration for concordant values	s the end point				
I Repeat the titration for concordant values	. Let Vz be the				
volume of EDIA constined.					
(3) Retermination of Permanent Hardness:					
- Take 100 ml of the hard water sample i	in a 250 ml				
beaker and boil gently for about ger	ntly for about				
Take 100 ml of the hard water sample is beaker and bail gently for about ger one hour. Then let it cool.	1 0				
-> Filter it into a 100 ml standard flas	ek and make				
the volume upto a mark.					
the volume upto a mark. Take 20 nel of this solution and proc	eed the titratio				
in the same way.					
-> The volume of 50TA used ceresponds	to the permanen				
hardness of the water sample. Let t	hardness of the water sample. Let the titer value				
be Va ml.	The volume of EDTA used corresponds to the permanent hardness of the water sample. Let the titer value be Va ml.				
Temporary hardness is calculated by subtracting fermanen					
Temporary hardness is calculated by subtracting fermanen hardness from total hardness.					
* OBSERVATIONS AND CALCULATIONS:					
1) TABLE 1: (Std. Hard Water vs EDTA &	olution)				
S.No. Volume of Std. Burette Reading Vol.	of Indicator				
	TA (m)				
1 20 0 19 19	EBT				
2 20 0 19.1 19	II EBT				
3 20 0 19.1 19	9.1 EBT				
: Concordant value of vol. of EDTA = 19.1 ml					
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I ml of Itd. Hard Water = 1 mg of Caloz Volume of Itd. hard water taken = 20 ml 20 ml of Itd. Hard Water = 20 mg of Caloz Volume of EDTA consumed = V, ml V, ml EDTA solution = 20 mg Caloz.

: 1 ml EDTA will be = 20 mg of equivalent Calo,.

> 1.04712 mg Calo3

12) TABLE 2: (Sample Hand Water vs EOTA tol.)

-						I.	
	S.No.	Volume of Sample	Burette	Reading	Vol- of	Indicator	
		hard water (ml)	Initial	final	EDTA		
_	1	20	0	9.4	9.4	EBT	
_	2	20	D	9.3	9.3	EBT	
	3	ಎ ಂ	0	9.3	9-3	EBT	
	Λ.	A 1 / 1					

Concordant Value of Vol. of EDTA= 9.3 ml Volume of EDTA consumed = V, ml New, if Inl of EDTA= 1.04712 ml

Then, V2 ml EDTA = 20 x V2 mg CalO3 => 9.73821 mg(alO3

Then, 1000 ml will contain = (20/V,) V2 x 1000 mg Call3

= V2 x 1000 mg Caloz

=) 486.910 ppm

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	Total Hardness =	486.910	bpm		
TABLE 3: (Boiled Sample hard water vs EDTA sol.)					
S.No	. Volume of Balled	Burette	Reading	Vol. of	Indicator
	Water (Int)	Initial	Final	EDTA	
1	20	0	5-3	5-3	FBT
2	20	0	5-2		EBT
3	20		5.2		EBT
Con	condant value	of vol.	of EDTA	=5-2 ml	•
Volu	me of EDTA cor	sumed =	$=$ V_3 m	l	
4 1 ml EOTA = 1.04712 ml					
Ther	Then, V3 ml of EDTA = 20 x V3 mg Calos				
	=> 5.44502 mg Cacoz				
				U	
The	Then, 1000 ml will contain = (20/V1) x V3 x 1000 mg (alog				
-			=) V3	X 1000 m	g Calos
-					
			=> 2=	12.251	pm.
: 1	ermanent Hardne	11 = 27	2.251 bb	m.	
1) Estimation of Temporary hardness:					
The temporary hardness of the given water sample = Total Hondness - Permanent Hardness					
-	total nonanes	s - Perm	anent"	Hardnes	٥ '
-7	→ 486.910-272.251 => 214.659 ppm				

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*	RESULT:
->	The total hardness of sample hard nater = 486.910 ppm
7	The permanent hardness of sample hard water = 272.251 ppm
7	The total hardness of sample hard water = 486.910 ppm The permanent hardness of sample hard water = 272.251 ppm The temporary hardness of sample hard water = 214.659 ppm
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