

## Alkalinity

- I. Purpose: To become familiar with the concept of alkalinity and its measurement in water.
- II. Definition: Alkalinity of a water is a measure of its capacity to neutralize acids.
- III. Materials:
  - Burette, 25 ml
  - Porcelain dish
  - Magnetic stirrer and rod
  - Beaker, 150 ml
  - Pipetter
  - Measuring cylinder, 100 ml
  - pH meter
  - 0.02N Sulphuric acid
  - Methyl Orange indicator
  - Phenolphthalein indicator
  - Tap water sample
  - Sweet water sample
  - Synthetic samples
- IV. Procedure - Indicator Method:
  1. Pipette exactly 100 ml of sample into a porcelain dish and drop in a magnetic rod.
  2. Mount a 25 ml burette and fill it to the mark with 0.02N sulphuric acid solution.
  3. Add 5 drops of Phenolphthalein indicator to the sample. If the solution turns pink, add acid slowly till pink color disappears. Record the volume of acid in milliliters as P.
  4. Add 5 drops of Methyl Orange indicator to the same sampling at the end of the first titration and add 0.02N sulphuric acid slowly till orange color turns to pink. Record this volume as M. Then,  $T = P+M$ .
- V. Procedure - Potentiometric Method (pH meter):
  1. Pipette exactly 100 ml of sample into a 150 ml beaker and drop in a magnetic rod.
  2. Fill the burette with 0.02N sulfuric acid solution.

3. If the pH of the sample is above 8.3 add 0.02N sulphuric acid slowly till pH 8.3. Record the volume of acid as P.
  4. Continue addition of acid till the pH of the sample reaches 4.5. Record volume of the acid as M. Then,  $T = P+M$ .
- VI. 1. Test additional water sample by either procedure.
- VII. 1. Determine the various species of alkalinity present in the samples using the relationships shown below.

Condition	$\text{OH}^-$	$\text{CO}_3^{=}$	$\text{HCO}_3^-$
1. $P = T$	T	0	0
2. $P = 1/2T$	0	2P	0
3. $P > 1/2T$	(2P-T)	2(T-P)	0
4. $P < 1/2T$	0	2P	(T-2P)
5. $P = 0$	0	0	T

2. Record the titration data in the following table.

Sample	P (ml)	T (ml)	P & T Condition
Tap water			
Sample A			
Sample B			
Sample C			

VIII. Calculations:

$$\text{Alkalinity, mg CaCO}_3/\text{l} = \frac{A \times N \times 50,000}{\text{ml sample}}$$

A = ml, sulphuric acid solution used  
 N = normality of acid solution.

Using the above data, calculate the concentrations of the various species of alkalinity for each sample and list in the following table.

Sample	$\text{OH}^-$	$\text{CO}_3^{=}$	$\text{HCO}_3^-$
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Tap water

Sample A

Sample B

Sample c

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