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# ALKALINITY OF WATER

Balancing Environmental Health



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# INTRODUCTION

A Brief Introduction about  
Alkalinity

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# ALKALINITY

- Alkalinity is a measure of how well water can neutralize acids.
- Unit – Milligrams per Litre (mg/L) or Parts Per Million (ppm).
- High alkalinity can make water "hard"
- Low alkalinity makes water "soft" but more corrosive.



## Introduction

- Alkalinity under 60 ppm indicate sensitive or unstable water. Over 100 ppm is desirable.
- There are 3 types of alkalinity based on anions present in water:
  - Hydroxide Alkalinity – occurs due to  $\text{OH}^-$  Ion
  - Carbonate Alkalinity – occurs due to  $\text{CO}_3^{2-}$  Ion
  - Bicarbonate Alkalinity – occurs due to  $\text{HCO}_3^-$  Ion



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# PHENOLPHTHALEIN ALKALINITY

Determination of alkalinity  
using Phenolphthalein

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## Phenolphthalein Alkalinity

- It measures the total alkalinity due to hydroxide and carbonate ions.
- • It is determined by titrating a water sample with phenolphthalein to an endpoint of pH 8.3.
- Phenolphthalein is a suspected carcinogen, so it should be handled with care while conducting experiments.
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# METHYL ORANGE ALKALINITY

Determination of alkalinity  
using Methyl Orange

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## Methyl Orange Alkalinity

- It measures the total alkalinity due to hydroxide, carbonate ions and bicarbonate ions.
- Methyl orange's chemical nature as an azo dye makes it a valuable pH indicator, transitioning between colours in the pH range of 3.1 to 4.4.
- Due to its reactivity in a low pH range, methyl orange is not suitable for titrating highly alkaline solutions.



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# EXPERIMENT

Experimentation Process for  
determination of alkalinity

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## Materials Required

- Conical Flask
- Pipette
- Burette
- Standard HCL solution
- Phenolphthalein
- Methyl Orange
- Given Water Sample



## Procedure









- Take 25mL of water sample in a titration flask and add 2-3 drops of phenolphthalein.
- Titrate it sample against HCL solution until pink colour produced by phenolphthalein just disappears
- Note down this reading as Phenolphthalein endpoint
- Now add 2-3 drops of methyl orange in same solution



## Procedure

- Continue Titration until yellow colour changes into orange
- Note the volume of acid used, this is methyl orange endpoint
- Use the table shown in previous slides to find out the new [P] and [M] and calculate hardness accordingly and hardness causing substance

# ALKALINITY CHART

Result of Titration	$\text{OH}^-$	$\text{CO}_3^{2-}$	$\text{HCO}_3^-$
$P=0$			M
$P=M$	$P=M$		
$P=\frac{1}{2}M$		$2P$	
$P>\frac{1}{2}M$	$2P-M$	$2(M-P)$	
$P<\frac{1}{2}M$		$2P$	$M-2P$

$$N_1V_1 = N_2V_2$$

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WHO A!





“Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less.”

—Marie Curie





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**THANK**  
**YOU**

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