Determination of total alkalinity of a given water sample Using standard hydrochloric acid
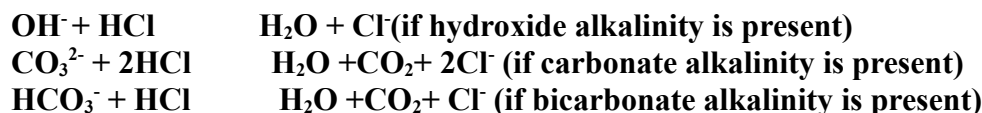
Alkalinity of water

It is the capacity of water to neutralize acid. Alkalinity in water is due to the presence of hydroxides, bicarbonates and carbonates. Alkalinity due to hydroxide is known as hydroxide alkalinity and alkalinity due to carbonates and bicarbonates is known as carbonate alkalinity.

Alkalinity in water may be due to
i) Presence of hydroxide only
ii) Presence of carbonates only
iii) Presence of bicarbonates only
iv) Presence of hydroxides and carbonates
v) Presence of carbonates and bicarbonates
When water containing alkalinity is titrated against standard hydrochloric acid solution the following reactions will take place depending on the presence of the alkalinity causing ions.

OH^- + HCl H_2O + Cl^-(if hydroxide alkalinity is present)
CO_3^{2-} + 2HCl H_2O +CO_2+ $2Cl^-$ (if carbonate alkalinity is present)
HCO_3^- + HCl H_2O +CO_2+ Cl^- (if bicarbonate alkalinity is present)

It is possible to determine the type of alkalinity present in a sample of water using N/50 sulphuric acid or hydrochloric acid using two indicators viz., phenolphthalein (Ph) and methyl orange (Mo). First phenolphthalein is used and end point corresponds to it followed by methyl orange indicator end point and following reaction takes place during titration.

When methyl orange indicator is added to water sample and titrated against standard hydrochloric acid solution all the three reactions mentioned above will take place. Hence titration with methyl orange indicator and further calculations will give total alkalinity. Hence titration of water sample is conducted against standard hydrochloric acid solution using methyl orange indicator.

PROCEDURE
$25cm^3$ of water sample is pipetted out into a clean $250cm^3$ conical flask and 2 drops of methyl orange indicator and the solution turns yellow due to alkalinity and titrated against standard hydrochloric acid solution taken in the burette till orange red colour is obtained.

Experiment no:

Observation and Calculations:

Burette: Standard hydrochloric solution
Conical flask: 25cm^3 of water sample+
Indicator: 2 drops of methyl orange indicator
End point: yellow toorange red

Trials Burette readings	I	II	III
Final reading			
Initial reading			
Volume of HCl run down in cm^3			

Normality of HCl= …………………...

1000cm^3 of 1N HCl solution = 50 g of CaCO$_3$
Therefore Vcm^3 of X N HClcontains = $\frac{XxVx50}{1000}$ =   (A g) of CaCO$_3$ in 25cm^3 of water sample

25cm^3 of waste water sample contains   (A) g of oxygen

Therefore 1000cm^3 of water sample contains $\frac{A \times 1000}{25}$………………….(B) g of CaCO$_3$ per litre

Or
B x 1000 mg /lit = ………………. mg/lit or ppm

RESULT: Alkalinity of water sample: ………………   **ppm**

Signature of the teacher