Assay of sodium hydroxide solution

NaOH solution

- From B.p, NaOH solution contains not less than 97.5% w/w of total alkali (as NaOH) and not more than 2.5 % w/w Na_2CO_3.
- **Assay:**

➢ 10 ml of unknown(bulb pipette).

➢ 25 ml of distilled water.

➢ Add 2.5 ml of barium chloride solution.

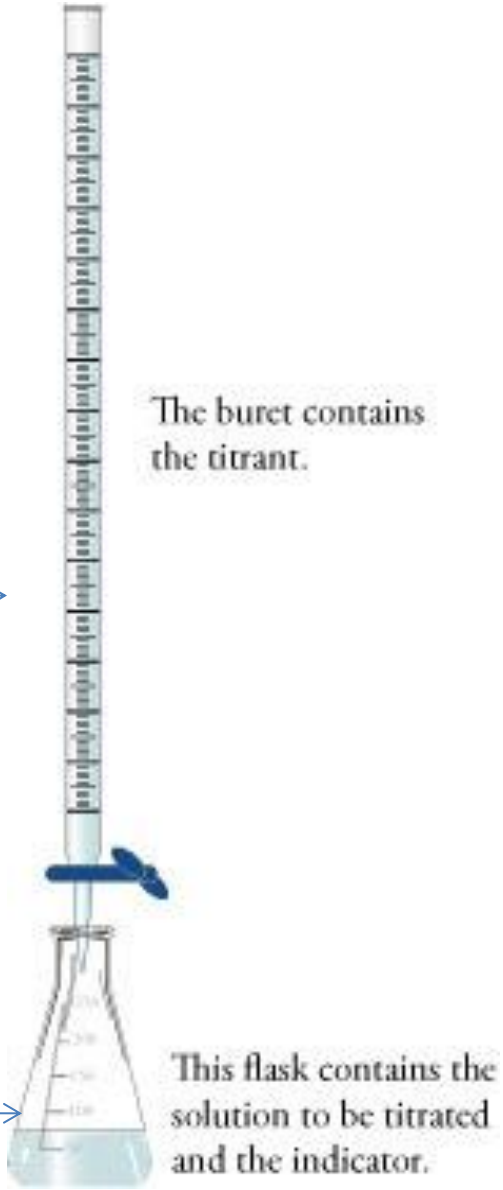
➢ Titrate with 1N HCl solution using 1-2 drops of phenolphthalein indicator.

➢ The first end point from pink ⟶ colorless(turbid)

➢ To the turbid sol. add 5 drops of Bromophenol Blue indicator and complete titration with 1N HCl .

➢ The second end point bluish violet ⟶ yellowish green

1N HCl solution



10 ml of unknown
25ml of D.W
2.5 ml of $BaCl_2$ solution
1-2 drops of ph.ph. ind. (1^{st} titration)
5-6 drops of B.p.B. ind. (2^{nd} titration)

Chemical principle:

- NaOH is strong base, absorbs CO_2

$$2NaOH + CO_2 \longrightarrow Na_2CO_3 + H_2O$$

- both NaOH and Na_2CO_3 react with HCl

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

$$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$$

When we assay a sample, we do the assay for total alkalinity contributed to NaOH and Na_2CO_3.

- Barium chloride ($BaCl_2$) is added to precipitate all carbonate

$$BaCl_2 + Na_2CO_3 \longrightarrow BaCO_3\downarrow + 2NaCl$$

soluble in alkaline

insoluble in alkaline

- ***1st titration***:

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

Why HCl do not react with $BaCO_3$?

Why the end point is turbid?

- ***2nd titration***:

$$2HCl + BaCO_3 \longrightarrow BaCl_2 + H_2O + CO_2$$

definition of <u>chemical factor</u>: the weight of substance that is chemically equivalent to 1ml of std. solution.

- **Calculation of the *chemical factor*:**

a) From reaction of HCl with NaOH:

1Mwt of NaOH ≡ 1 Mwt HCl

1 Mwt of NaOH ≡ 1 eqwt HCL

1 ✖40 gm of NaOH ≡ 1 liter of 1*N* HCl

40/1000 gm NaOH ≡1ml of 1*N* HCl

0.04 gm of NaOH ≡ 1ml of 1*N* HCl of total alkalinity calculated as NaOH(chemical factor)

b) From reaction of 2HCl with Na_2CO_3

2Mwt of HCl ≡1Mwt of $BaCO_3$ ≡1Mwt Na_2CO_3

1Mwt Na_2CO_3 ≡ 2Mwt of HCl

1Mwt Na_2CO_3 ≡ 2 eqwt of HCl

½ Mwt Na_2CO_3 ≡ 1 eqwt of HCl

106/2 gm Na_2CO_3≡ 1liter of 1*N* HCL

53 gm Na_2CO_3 ≡ 1liter of 1*N* HCL

53/1000 gm Na_2CO_3 ≡ 1ml of 1*N* HCL

0.053 gm Na_2CO_3 ≡ 1ml of 1*N* HCL (chemical factor)

- **Calculations** :

V_1 is the of HCl consumed in the 1st titration

V_2 is the of HCl consumed in the 2nd titration

$V_1+V_2= V_3$ total HCl consumed.

correct the V_3 according to this equation:

$V \times N= V' \times N'$

Corrected V'_3 x 0.04= gm wt. of total alkali

gm 10

? 100

Then the % w/v of total alkali

- **Calculation**

Corrected V'_2 x 0.053= gm wt. of Na_2CO_3

gm	10
?	100

Then the % w/v of Na_2CO_3 in the unknown