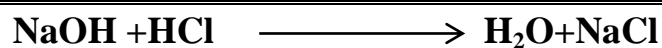


Acid –Base Titration

Titration is a technique where by one solution is chemically balanced with another solution. In acid –base titration an acid solution is balanced with a base for the purpose of determining the concentration of one or the other.

Neutralization is the complete reaction of an acid with a base to form water and salt.



When titration is used to standardize a base solution a carefully measured volume of an acid solution of known concentration (standard solution) is used, a few drops of an indicator are added. acid –base indicators are complex organic compounds that exist in at least two different colored forms. The colored form is dependent upon whether they are in acid, base or neutral conditions. As an example the indicator phenolphthalein is colorless under acid condition and pink under basic condition. The first change in color of the indicator is the end of titration (the end point or equivalence point).

The concentrations of solutions used in acid –base titration may be expressed in terms of molarity (M) or normality (N).

Molarity is the number of moles of solute in one liter of solution (M: moles/liter) .

Normality is the number of the equivalent weight of a compound in a liter of solution. (N: equivalent weight/ liter).

$$\text{An equivalent weight of an acid} = \frac{\text{gram molecular weight}}{\text{No. of (H) atoms that can be replaced}}$$

$$\text{An equivalent weight of a base} = \frac{\text{gram molecular weight}}{\text{No. of (OH) atoms that can be replaced}}$$

At end of titration the number of equivalents of acid equals the number of equivalents of base:

$$\mathbf{N_a V_a = N_b V_b}$$

Procedure:

Standardization of HCl solution

- 1- In a conical flask of 100 ml. add 5 or 10 ml. of HCl.
- 2- Rinse and fill a clean 25ml. burette with 0.1 N NaOH, be careful that no air bubbles are in tip of the burette.
- 3- Record the initial reading to the nearest 0.01 ml. on the data sheet.
- 4- Add 2 drops of phenolphthalein indicator solution and mix by swirling.
- 5- Slowly add NaOH solution from the burette to the titration flask, the first drops yield a pink color which quickly disappears upon swirling.
- 6- Continue to add the NaOH solution until a very slight pink color persists. This is the end point.
- 7- Record the reading from the burette as the final reading.
- 8- The difference between the initial and the final readings is the volume.

Note:

A dark pink color indicates an over titration.

Calculation:

Calculate the N of HCl solution using $N_a V_a = N_b V_b$

Reagent:

- 1- Phenolphthalein indicator: 2 gm in 50% ethanol in water.
- 2- 0.1 N NaOH .
- 3- HCl solution.