

Titration

An important analytical technique, titrations are used to determine the concentration of a substance in solution by comparing it to a solution of a known concentration; called a **standard**

The reaction between the unknown and the standard is allowed to proceed until mole ratios like those in the balanced chemical equation are reached.

This stoichiometric point (sometimes called the equivalence point or end point) is determined using some sort of chemical indicator

Often these reactions are used with acids/bases, for acid/base titrations the end point is reached when:

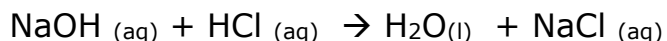
Moles of OH⁻ from the base = moles of H⁺ from the acid

Titration consists of several trials; the first is an estimate, usually done quickly to get an approximate endpoint, almost always the first trial will be over the endpoint (overshot) The average volume of the second and subsequent trials are used in calculations:

Steps to follow

- 1) Write the balanced equation (as always – you can't go wrong with this)
- 2) Calculate the moles of standard used ($n = M \times V$)
- 3) Determine the moles of unknown using the mole ratio
- 4) Calculate the unknown concentration ($M = n/V$)

Ex. If 10.0mL of HCl is titrated with 20.0mL of 0.40M NaOH, what is [HCl]?



- Some acids or bases produce two (or more) H⁺ or OH⁻ for each formula unit (H₃PO₄ → **3 H⁺** + PO₄³⁻)

Ex. An average volume of 24.90mL of 0.100 M NaOH was required to neutralize 15.00mL of H₂SO₄. What is the concentration of the acid?