Appendix XV: Titration

Titration is a quantitative chemical analysis that is used to determine the unknown concentration of an analyte in a sample by using a known concentration of titrant. By using a calibrated burette, the exact amount of the titrant that has been reacted with analyte can be determined when the endpoint of the reaction is reached. The endpoint is a status at which the titration is complete, as determined instrumentally or visually with the aid of a suitable indicator.

(1) **Preparation of test sample** – Powder the CMM sample before analysis. The quantity of the sample to be powdered should be of at least five times as much as those needed for the analysis.

(2) **General requirements for the apparatus** – The titration apparatus consists of calibrated burette filled with known concentration of titrant, a conical flask containing the solution of the analyte, a suitable indicator to show the end point of titration, and a magnetic stirrer for mixing the reaction solutions, or using appropriate method for mixing when necessary.

(3) **Quantitative procedure** – Set up the titration apparatus. Fill the burette with titrant solution and check for air bubbles and leaks. Record the initial volume of the titrant solution. Prepare the solution of the analyte together with suitable indicator and place it in a conical flask. Use the burette to deliver a stream of titrant solution into the conical flask. Record the final volume of the titrant solution at the endpoint of titration. Calculate the percentage content of the analyte in the sample by using the following equation –

$$\text{Content (\%) of the analyte} = \frac{V_{Titrant} \times C_{Titrant} \times Mw_{Analyte}}{F \times 1000 \times W}$$

where

$V_{Titrant}$ = Volume of titrant solution used, mL
$C_{Titrant}$ = Molarity of titrant solution, mol/L
$Mw_{Analyte}$ = Molecular weight of the analyte
W = Weight of sample used, g
F = Stoichiometric factor of the balanced equation