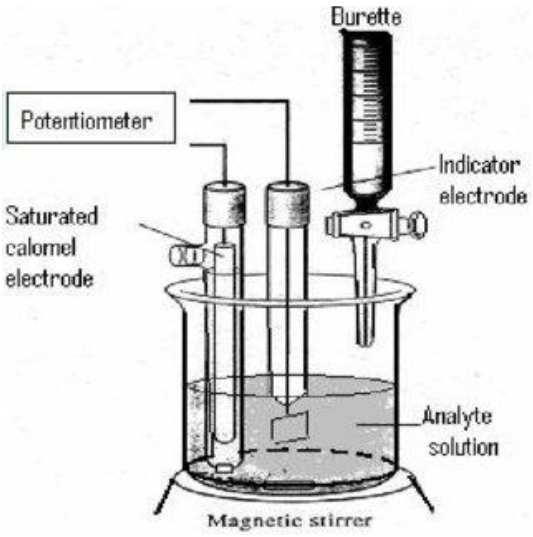
Potentiometric titrations

Potentiometric titrations are a type of titration technique used to determine the concentration of an analyte in a solution by measuring the change in electrical potential (voltage) as a titrant is added to the solution. Potentiometric titrations are especially useful for redox titrations because they offer precise and accurate measurements, and the endpoint can be easily detected.



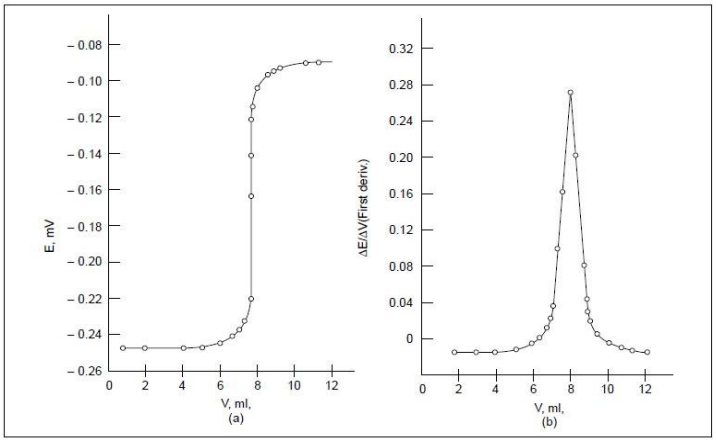
1. Apparatus:
    - A reference electrode (usually a saturated calomel electrode or a silver/silver chloride electrode).
    - A working electrode (usually a platinum electrode or another inert electrode).
    - A potentiostat, which controls and measures the potential difference between the working and reference electrodes.
    - A titration setup, such as a burette, for adding the titrant to the analyte solution.
2. Preparation:
    - Prepare the analyte solution, which contains the substance you want to determine the concentration of.
    - Place the reference and working electrodes in the analyte solution.
    - Connect the electrodes to the potentiostat.
3. Calibration:
    - Calibrate the potentiostat using a standard solution of the titrant.

- Determine the electrode potential (voltage) for a known concentration of the titrant.

4. Titration:
    - Start the titration by adding the titrant to the analyte solution slowly and under constant stirring.
    - Continuously monitor the potential difference between the working and reference electrodes using the potentiostat.
5. Endpoint Detection:
    - The endpoint of the titration is determined by the change in potential (voltage) observed when the redox reaction is complete.
    - This change is typically indicated by a sudden jump or inflection point in the titration curve, which represents the equivalence point where the analyte has reacted completely with the titrant.
6. Calculation:
    - Calculate the concentration of the analyte based on the volume and concentration of the titrant added.

Observations

S.No	Volume of titrant ($K_2Cr_2O_7$)	EMF	ΔE	ΔV	ΔE/ ΔV



Potentiometric titration curves for accurately determining the endpoint

From $N_2V_2 = N_1V_1$

Where

N_2= Normality of $K_2Cr_2O_7$

V_2 = Volume of $K_2Cr_2O_7$

N_1 = Normality of Analyte (Ferrous = ?)

V_1 = Volume of Analyte

By substituting the values the strength of the analyte can be calculated.