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# **METHOD TO DETERMINE END POINT OF POTENTIOMETRY TITRATION, APPLICATION**

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## POTENTIOMETRIC TITRATION

**It's a volumetric method in which potential between two electrodes (reference & indicator) is measured as a function of added reagent volume.**

- **Types of Potentiometric titrations:**
  - **Acid-base titration**
  - **Redox titration**
  - **Complexometric titration**
  - **Precipitation titration**



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## ACID-BASE TITRATION

**Neutralization titrations are performed with standard solutions of strong acids or bases. While a single solution (of either acid or base) is sufficient for the titration of a given type of analyte, it is convenient to have standard solutions of both acid and base available in case back-titration is needed to locate the end point more exactly.**

- The concentration of one solution is established by titration against a primary standard. The concentration of the other is then determined from the acid/ base ratio (that is, the volume of acid needed to neutralize 1.000 mL of the base).**



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## PRECIPITATION TITRATION

- **Volumetric methods based upon the formation of slightly soluble precipitate are called " precipitation titration " .**
- **Because of the precipitating titration based upon utilizing silver nitrate**
- **(AgNO<sub>3</sub>) as a precipitating agent, then it called " argentimetric processes " .**
- **Precipitation titration is a very important , because it is a perfect method for determine halogens and some metal ions**
- **Ex: Titration of mixture of Cl<sup>-</sup> & Br<sup>-</sup> & I<sup>-</sup> with AgNO<sub>3</sub>**



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## COMPLEXOMETRIC TITRATION

- **Complex ions ( coordination compounds) are produce from reaction of many metal ions (electrons acceptor) with electron pair donors .**
- **The donor species (or called ligands) must have at least one pair of unshared electrons for bond formation.**
- **metal and membrane electrodes for determination of many cations (mixture of  $\text{Bi}^{3+}$ ,  $\text{Cd}^{2+}$  and  $\text{Ca}^{2+}$  using EDTA)**



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## **OXIDATION-REDUCTION TITRATION**

- **A redox titration is a type of titration based on a redox reaction between the analyte and titrant.**
- **Redox titration may involve the use of a redox indicator and/or a potentiometer.**
- **Common examples of a redox titration is treating a solution of iodine with a reducing agent and using starch as an indicator. Iodine forms an intensely blue complex with starch. Iodine ( $I_2$ ) can be reduced to iodide ( $I^-$ ) by e.g. thiosulphate ( $S_2O_3^{2-}$ ), and when all iodine is spent the blue colour disappears. This is called an iodometric titration**



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## **GENERAL METHOD FOR POTENTIOMETRY:**

- **Connect the saturated calomel electrode to the positive terminal or socket and the glass electrode to the negative.**
- **Adjust the meter to zero and standardize the electrode system as above. as subsequent readings are to be taken with the stirrer motor running.**
- **Rinse the beaker and electrodes thoroughly with water, then with the solution to be titrated and place a measured volume in the beaker**
- **Switch on the stirrer and measure the pH of the solution.**





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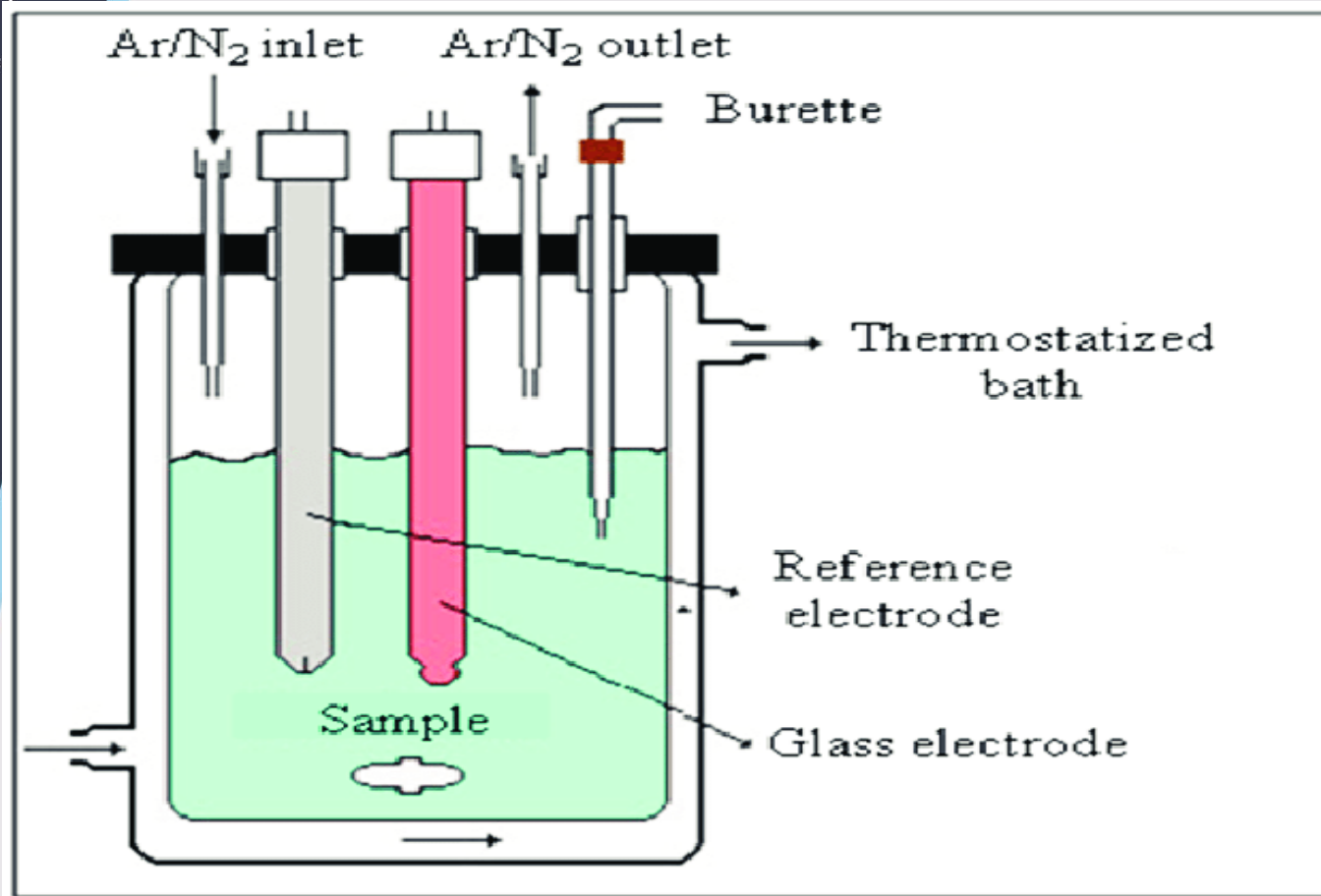
- **Add about 2ml of titrant ,allow sufficient time to mix and measure the pH of the solution.**
- **Add further quantities of titrant and as the end point is approached reduce to 0.1ml increments and measure the corresponding values of the pH.**
- **Obtain further readings of pH for about 5ml beyond the equivalence point. Switch the meter to standby and turn off the stirrer. wash the beaker and electrodes thoroughly with the distilled water.**
- **Plot a graph of pH (vs) titrant added. Read off the equivalence point from the graph and calculate any required data from this value**





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**DIAGRAM OF POTENTIOMETRIC TITRATION**



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## APPLICATIONS

- **Clinical chemistry:** Ion selective electrodes are present sensors for clinical samples because of their selectivity for analyte in complex matrices. The most common analytes are electrolytes such as Na, K, Ca, H, and Cl and dissolved gases such as CO<sub>2</sub>
- **Environmental chemistry:** For analysis of CN<sup>-</sup>, NH<sub>3</sub>, NO<sub>3</sub>, F<sub>3</sub> in water and waste water.
- **Potentiometric titrations:** For determining the equivalence point of an acid base titration. • possible for redox, precipitation, acid-base, complexation as well as for all titrations in aqueous and non aqueous solvents.
- **Agriculture:** NO<sub>3</sub>, NH<sub>4</sub>, I, Ca, K, CN, Cl in soils, plant materials, feed stuffs, fertilizers.
- **Detergent manufacturing:** Ca, Ba, F for studying effects in water quality.



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