

TITRATION OVERVIEW

CHEM 25 | SDSU

TITRIMETRY

- Four types of titrations based on the reaction chemistry:
 - Acid-Base
 - Complexation
 - Precipitation
 - Redox
- Though the chemistry for each reaction is different the fundamental aspects of each type of titration remain the same.

REQUIREMENTS FOR TITRIMETRIC ANALYSES

- We must know the reaction **stoichiometry** for our titrant and analyte.
- The reaction must **proceed to completion**; stoichiometric mixing of titrant and analyte results in their reaction.
- The reaction must occur **rapidly**.
- There must be a means of **determining the end point**.

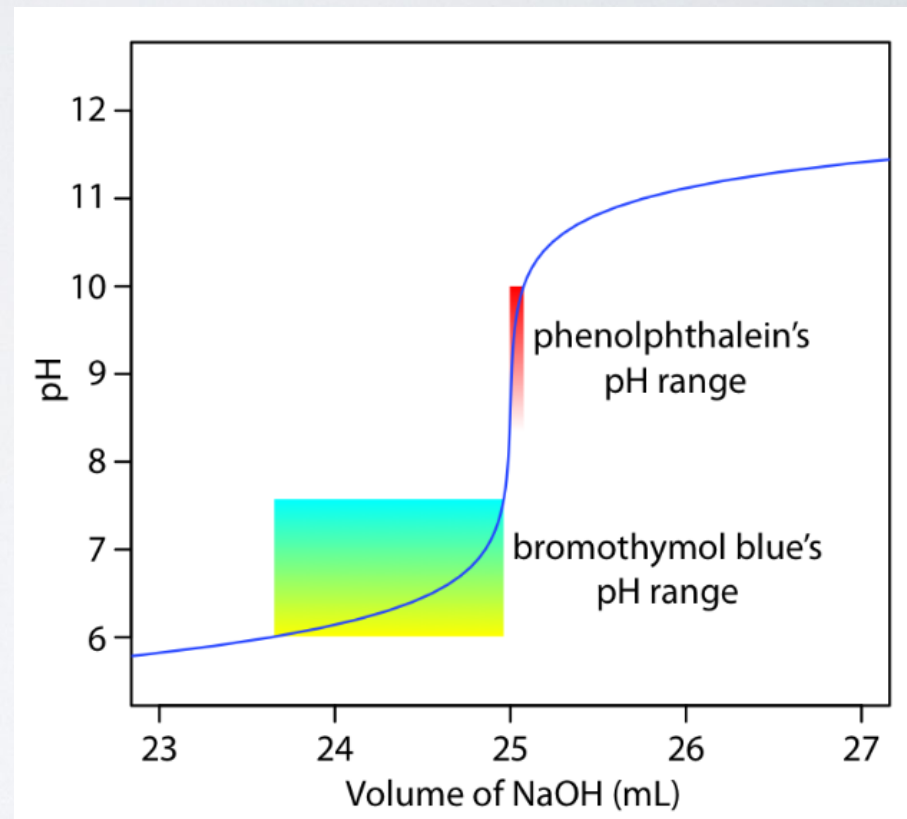
EQUIVALENCE VS END POINT

- The **end point** of the titration and the **equivalence point** of the titration reaction may not occur at the same point.
- The **end point** is an arbitrary stopping point for the titration. A point that can be reproducibly achieved, such as the point of a color change for an indicator.
- The **equivalence point** is the stoichiometric end of the reaction. When equivalent amounts of titrant and analyte have been reacted.

ENDPOINT ERROR

- If the end point is far from the equivalence point this can introduce significant, but determinant errors, into the analysis.
- The use of an external standard can compensate for the error in the analysis, provided that the analyte and standard have very similar equivalence point conditions (e.g. pH, cell potential).

Color transitions of two acid-base indicators



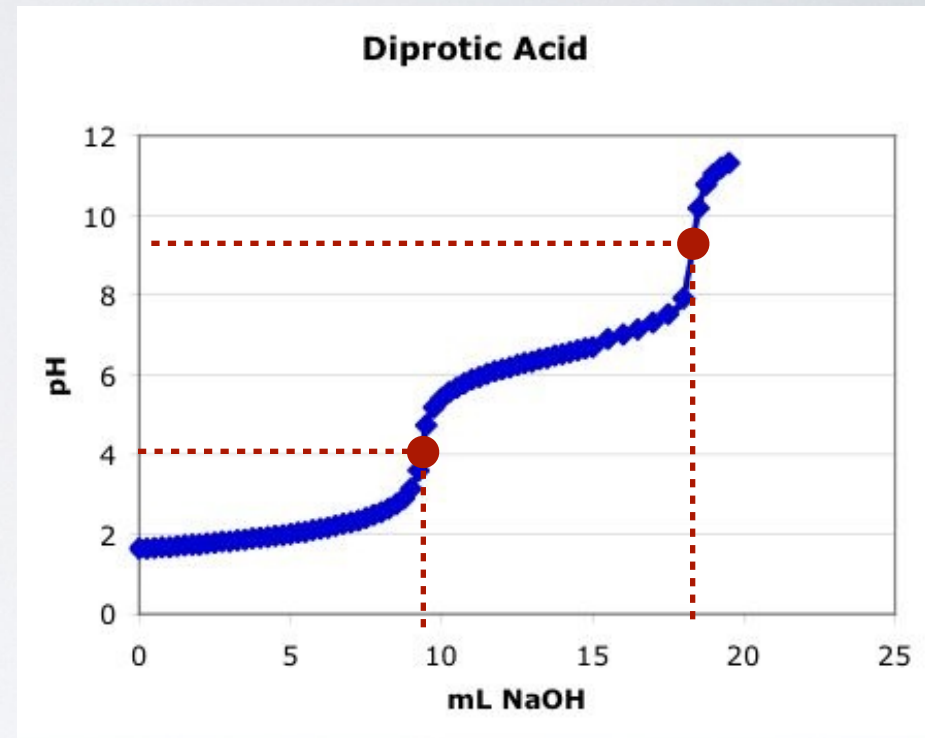
Titration of a strong acid with NaOH.

TITRATION PROCEDURE

- In general the procedure for a titrimetric analysis is as follows:
 - A pure primary standard (e.g. benzoic acid) is accurately prepared and aliquoted for analysis.
 - The primary standard is titrated with a stock titrant (e.g. sodium hydroxide); calibrating the titrant in the process.
 - The titrant (now a secondary standard) is used to titrate an accurately prepared aliquot of the unknown.

TITRATION CURVES

- Titration curves can be generated by collecting titration data, or predicted mathematically.
- The titration curve indicates the equivalence point(s) along with other details about the titration reaction.



Red dots represent the equivalence points for the titration.