Chemistry 201

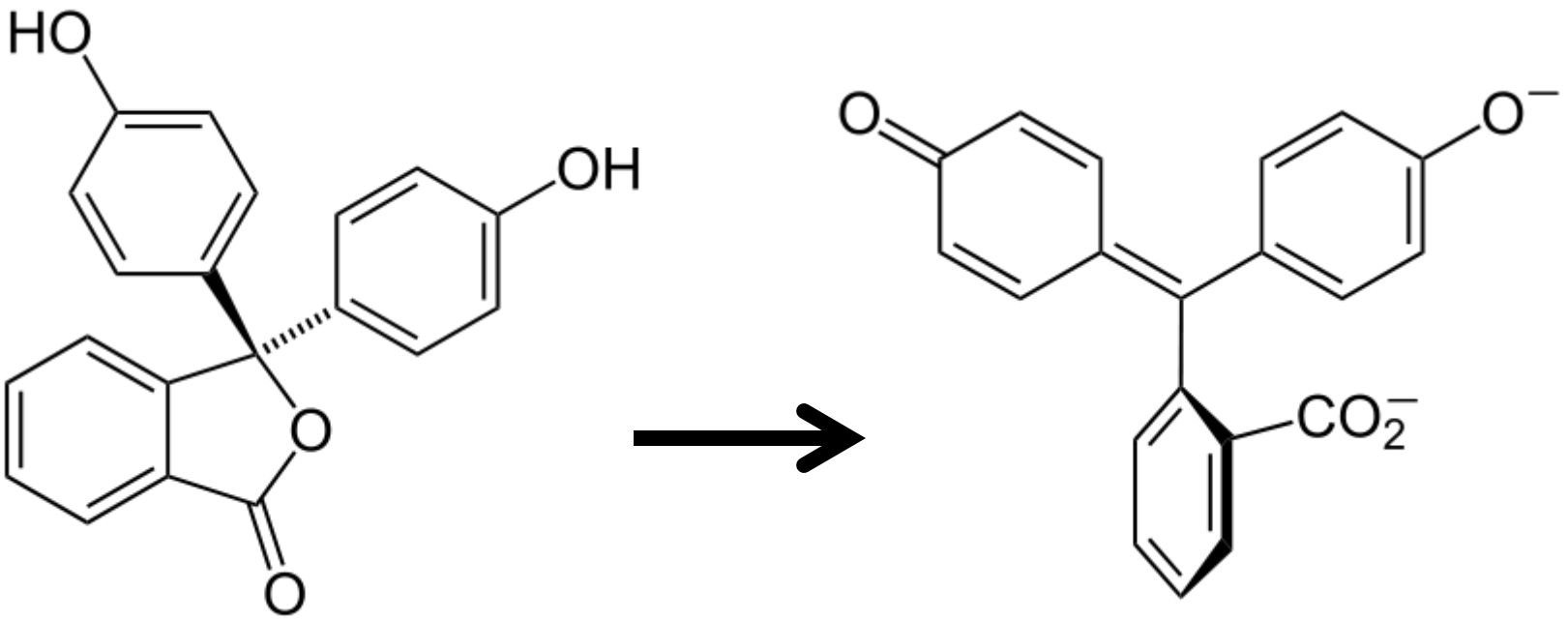
Implementation of a Titration

NC State University

Titration: quantitative analysis

Titration is a laboratory method of quantitative analysis used to determine uknown concentration of an analyte. We can also call it volumetric analysis. First, we prepare a standard solution of the titrant. Then we measure how much titrant is required to produce an optical change. pH titrations are only one kind of titration. Typically, we will use a pH indicator and add a known volume of acid to base (or base to an acid). The end point is reached when the indicator changes color. One of the most common indicators in pH titrations Is phenolphthalein

pH indicators: phenolphthalein

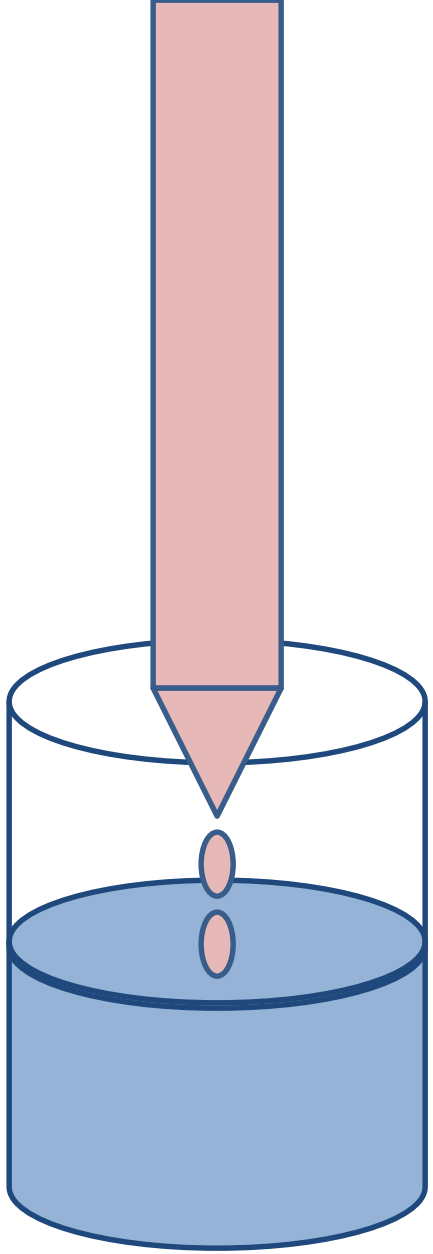


Colorless **Pink**

Phenolphthalein changes color at pH 8.2.

Titration

The procedure is to use a buret to accurately dispense a known volume of the titrant. The end-point is reached when the unknown solution changes color. We add a very small amount of indicator to the unknown in order to see the color change.

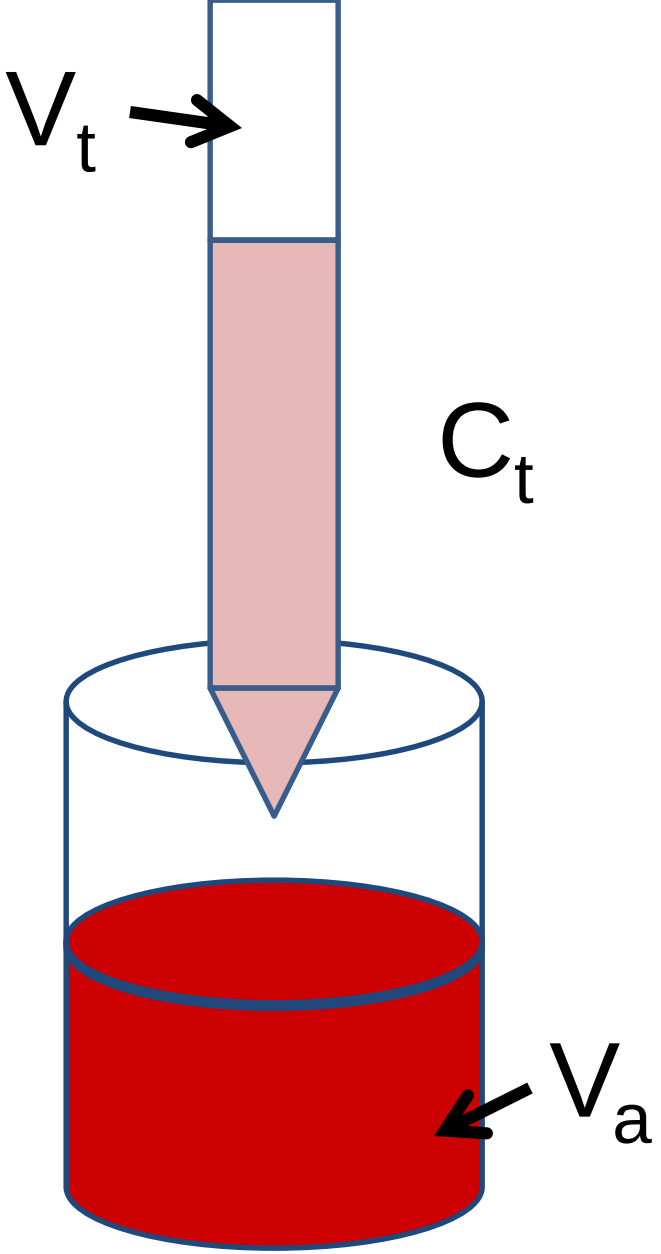


Titration

If an acid is neutralized by a base then we can assume that dilution factor of the base (titrant) times its known concentration gives us the concentration of the acid.

$$C_a = \frac{V_t}{V_a} C_t$$

If the stoichiometry of the analyte and titrant is not 1:1 then we need to multiply by the appropriate factor.



Titration when the stoichiometry is not 1:1

If we want to determine the amount of oxalic acid dissolved in water, we can add a known amount of NaOH until the equivalence point is reached.

$$2\,NaOH + C_2O_4H_2 \rightarrow 2H_2O + Na_2C_2O_4$$

In this case, we require two moles of NaOH for each mole of oxalic acid. The concentration of the analyte is:

$$C_a = \frac{V_t \nu_a}{V_a \nu_t} C_t$$

Where ν_a and ν_t are the stoichiometric coefficients.