

Name: Key  
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Chemistry 12  
ACID BASE PART II Lesson # 18  
PRACTICAL ASPECTS OF TITRATIONS

To carry out a titration you must have a solution of KNOWN concentration. This is also referred to as a STANDARDIZED or a STANDARD SOLUTION.

A PRIMARY STANDARD is a substance that is used to determine the concentration of a standard solution. A primary standard is one that can be obtained in a pure and stable form (does not absorb CO<sub>2</sub> or H<sub>2</sub>O from atmosphere) and has a known molar mass.

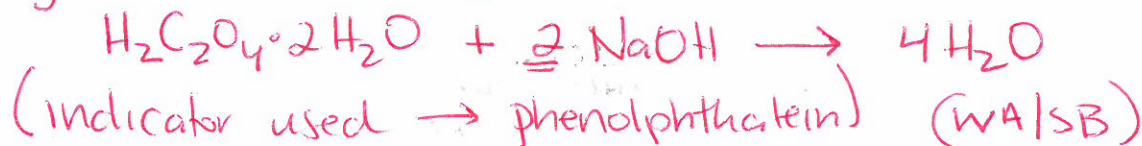
There are TWO WAYS to prepare a **STANDARD SOLUTION**:

1. To prepare a standard solution of a base eg. NaOH

a. Potassium hydrogen phthalate ( $\text{KHC}_8\text{H}_4\text{O}_4 = 204.22 \text{ g/mol}$ )  
20.422g \* diluted to 1.0 L \*  $\rightarrow [0.1000 \text{ M}]$  reacts with NaOH (phenolphthalein or T.B.)  
 $\text{KHC}_8\text{H}_4\text{O}_4 + \text{NaOH} \rightarrow \text{NaKC}_8\text{H}_4\text{O}_4 + \text{H}_2\text{O}$

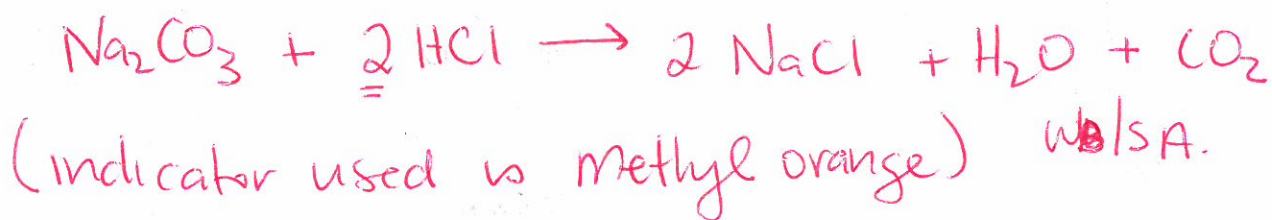
MOST COMMONLY USED ACIDIC PRIMARY STANDARD

b. Oxalic acid dihydrate ( $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O} = 126.07 \text{ g/mol}$ )  
12.607g diluted to 1.0 L  $\rightarrow [0.1000 \text{ M}]$  reacts with NaOH.



2. To prepare a standard solution of an acid eg. HCl

Sodium Carbonate ( $\text{Na}_2\text{CO}_3 = 105.99 \text{ g/mol}$ )  
10.599g diluted to 1.0 L  $\rightarrow [0.1000 \text{ M}]$  reacts with HCl



SEATWORK: Do Exercises 121-123 pg 165 in HEBDEN

PLO's: P1 (PRIMARY STANDARDS AND STANDARDIZED SOLUTIONS)

## TYPES OF NEUTRALIZATION REACTIONS

Recall from earlier in this unit that we investigated the Formula, Complete and Net Ionic equations for a STRONG ACID and STRONG BASE neutralization reaction:

Ex. When NaOH reacts with HCl

- i.  $\text{NaOH (aq)} + \text{HCl (aq)} \longrightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$
- ii.  $\text{Na}^+ \text{(aq)} + \text{OH}^- \text{(aq)} + \text{H}^+ \text{(aq)} + \text{Cl}^- \text{(aq)} \longrightarrow \text{Na}^+ \text{(aq)} + \text{Cl}^- \text{(aq)} + \text{H}_2\text{O (l)}$
- iii.  $\text{OH}^- \text{(aq)} + \text{H}^+ \text{(aq)} \rightleftharpoons \text{H}_2\text{O (l)}$   
 $\longrightarrow 2 \text{H}_2\text{O (l)} \rightleftharpoons \text{OH}^- + \text{H}_3\text{O}^+$

When the  $[\text{H}_3\text{O}^+] = [\text{OH}^-]$  the solution is NEUTRAL, but if one is in excess it is either basic or acidic (depending on which ion is in excess)

When a WEAK ACID is reacted with a STRONG BASE:

eg. HF + NaOH

- i.  $\text{HF (aq)} + \text{NaOH (aq)} \longrightarrow \text{NaF (aq)} + \text{H}_2\text{O (l)}$
- ii.  $\text{HF (aq)} + \text{Na}^+ \text{(aq)} + \text{OH}^- \text{(aq)} \longrightarrow \text{Na}^+ \text{(aq)} + \text{F}^- \text{(aq)} + \text{H}_2\text{O (l)}$
- iii.  $\text{HF (aq)} + \text{OH}^- \text{(aq)} \rightleftharpoons \text{F}^- \text{(aq)} + \text{H}_2\text{O (l)}$

When a WEAK BASE is reacted with a STRONG ACID:

Ex.  $\text{NH}_3 + \text{HCl}$

- i.  $\text{NH}_3 \text{(aq)} + \text{HCl (aq)} \longrightarrow \text{NH}_4^+ \text{(aq)} + \text{Cl}^- \text{(aq)}$
- ii.  $\text{NH}_3 \text{(aq)} + \text{H}^+ \text{(aq)} + \text{Cl}^- \text{(aq)} \longrightarrow \text{NH}_4^+ \text{(aq)} + \text{Cl}^- \text{(aq)}$
- iii.  $\text{NH}_3 \text{(aq)} + \text{H}^+ \text{(aq)} \rightleftharpoons \text{NH}_4^+ \text{(aq)}$

NOTE: STRONG ACIDS / STRONG BASES + SALTS IONIZE 100%  
ALL WEAK ACIDS / WEAK BASES DO NOT!

SEATWORK/HOMEWORK: Worksheet

PLO's: P4