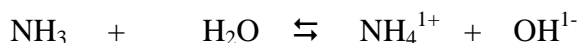
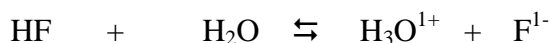


Acids & Bases Notes #5: Titrations with Weak Acids & Strong Bases

Recall that buffer systems involve combinations of weak acids and weak bases.

Recall $\text{Molarity} = \frac{\text{moles}}{\text{Liter}}$ $\text{moles} = (\text{Molarity}) \times (\text{Volume in Liters})$

Recall that hydrolysis reactions occur when weak acids or weak bases are added to water.



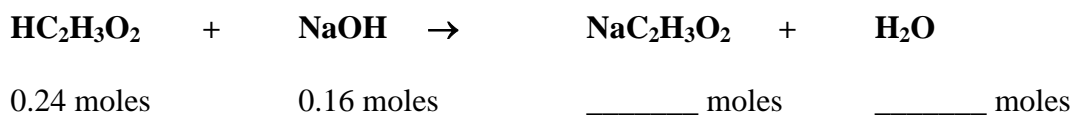
Reactions involving strong acids or strong bases are written with a single arrow.

Equivalence Point = “Perfect Stoichiometry” between an acid and a base.

Perfect Stoichiometry Conditions:

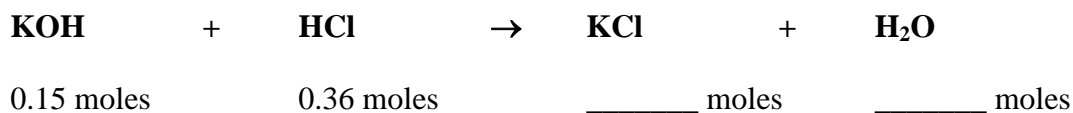


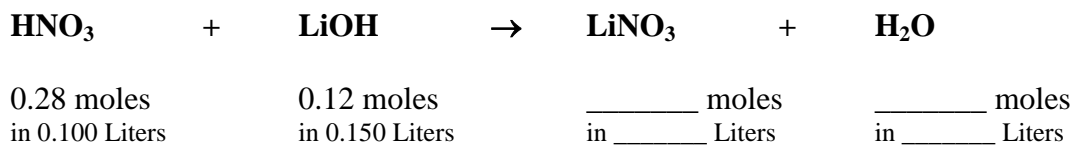
Limiting Excess Stoichiometry:



What is the limiting reactant in the above problem? _____

How many moles of leftover $\text{HC}_2\text{H}_3\text{O}_2$ will be present AFTER this reaction has occurred?





How many leftover moles of HNO_3 will be present at the end of this reaction? _____

What will be the final volume of the mixed chemicals? _____

What will be the molarity of the “leftover” HNO_3 ? _____

What will be the final **pH** of the solution? _____

What will be the final molarity of the LiNO_3 that is produced in this reaction? _____

Sample Problems:

1. Calculate the pH of the solution that is formed if 55.0 mL of 0.250 M NaOH is added to 70.0 mL of 0.250 M $\text{HC}_2\text{H}_3\text{O}_2$. The K_a for $\text{HC}_2\text{H}_3\text{O}_2$ is 1.8×10^{-5} .



pH = 5.30

2. Calculate the pH at the **equivalence point** in a titration involving 30.0 mL of 0.880 M HC₂H₃O₂ with 0.500 M NaOH.



pH = 9.11

3. Calculate the pH at the **equivalence point** in a titration reaction involving 0.150 M HCl and 100.0 mL of 0.250 M NH₃.

pH = 5.14

Four Types of Acid – Base Reaction Scenarios

I. Strong & Strong

Molarity Madness

Do limiting/excess stoichiometry, calculate leftover molarity of excess, determine pH or pOH

II. Strong & Weak (Strong in Excess)

Perform stoichiometry first, then immediately determine the pH of system.

Leftover strong dictates pH of system. Can ignore the effect of any subsequent hydrolysis process.

III. Strong & Weak (Weak in Excess)

1. Perform stoichiometry first to react all of the strong acid or strong base.

2. Now treat as buffer problem (RICE Chart) and calculate final pH of the system.

IV. Strong & Weak (Equivalence Point)

1. Perform stoichiometry first to react all of the strong acid or strong base.

2. Now treat as hydrolysis problem (RICE Chart) and calculate final pH of the system.