Neutralization Reactions and Titration

Name: _____ Period: ____

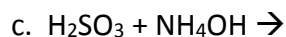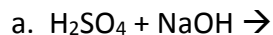## Neutralization Reactions:

HCl + NaOH →

- The general formula for a neutralization: _____
- Acids and bases are _____ each other
  - acids _____, bases _____
- When they combine they _____ each other – neither _____ nor _____ anymore

Practice: Neutralization Reactions

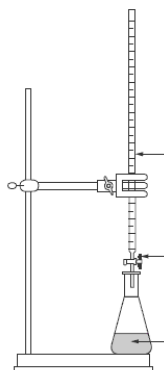1. Complete and balance the neutralization reaction below, label the acid and the base in each reaction:

   a. H_2SO_4 + NaOH →

   b. HCl + $Ca(OH)_2$ →

   c. H_2SO_3 + NH_4OH →

Titrations:

Definition: adding a _____ amount of solution of _____ to a solution with a _____.

    GOAL : _____

Titration set-up: Label the parts the arrows are pointing to:

Equivalence Point:

_____: the point of neutralization in a titration

_____: the point where the moles of H^+ and OH^- are equal – usually close to the endpoint (not always at pH = 7)

- _____acid and _____ base, pH around ____
- _____acid and _____ base, pH _____
- _____acid and _____ base, pH _____

How do we know we reached the endpoint?

a. _____

b. _____

Sketch a graph and label the equivalence point:

<u>**Titration Calculations:**</u>

After we do the experiment, how do we determine the concentration of the known??? _____

Steps:

1. Write and balance the equation.
2. List what you know (vol of acid, vol of base, conc of standard, mole ratio)
3. Begin with the volume (L) of the standard solution
4. Set up dimensional analysis to determine the number of moles of the unknown (Use the known molarity and the mole to mole ratio as conversion factors)
5. Divide by the volume (L) of the unknown to find molarity of the unknown

Practice:

1. 20.0 mL of 0.100 M HCl are titrated with 19.5 mL of an NaOH solution. What is the molarity of the NaOH solution?

    a. Write and balance the equation. List what you know and don't know.

    b. Set up dimensional analysis to find moles for the substance of unknown concentration. (NaOH)

    c. Divide the number of moles of NaOH by the volume of NaOH to find molarity.

2. In a titration, 33.21 mL of 0.3020 M strontium hydroxide ($Sr(OH)_2$) solution is required to exactly neutralize 20.00 mL of hydrofluoric acid solution (HF). What is the molarity of the hydrofluoric acid solution?

    a. Write and balance the equation. List what you know and don't know.

    b. Set up dimensional analysis to find moles for the substance of unknown concentration. (NaOH)

    c. Divide the number of moles of NaOH by the volume of NaOH to find molarity.

<u>**Check for understanding:**</u>

A 35.00 mL sample of HBr solution is titrated to an endpoint by 14.76 mL 0.4122 M NaOH solution. What is the molarity of the HBr solution? *Show all your work*