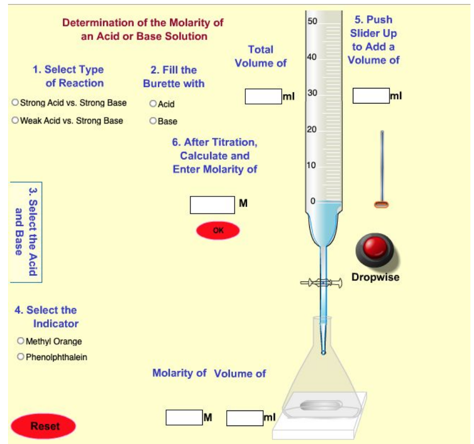
Acid - Base Titration Activity

The concentration of an acid or a base can be determined experimentally through a process called *titration*, where a base of unknown concentration is slowly dripped into a flask containing a specific volume and concentration of an acid. To that acid is also added an indicator, which is a substance that changes color based on the pH of the solution. One of the most common acid/base indicators is phenolphthalein, which is clear under acidic conditions (pH<7) and turns bright pink in basic solutions (pH>8). By carefully adding the unknown base (recording the volume added) to the known acid solution, the concentration of the base can be calculated using $M_aV_a = M_bV_b$ (found in Table T).



In this activity, you'll be using a titration simulation to determine the concentration of an unknown base.

<u>Procedure</u>

Click the following link and enable Flash - [Acid - Base Simulation]() - Then follow the numbers in order. (If you skip a step, it won't work.)

1. Select Type of Reaction: Strong Acid vs. Strong Base
2. Fill the Burette with: Base
3. Select the Acid and Base (this is a slide out bar on the left): Acid - HCl, Base - NaOH
4. Select the Indicator: Phenolphthalein
5. Push Slider Up to Add a Volume of Base
    a. Now that your burette is filled with the unknown base, notice that the Molarity and Volume of HCl fields have been populated. These will be random numbers each time you try the simulation (reset button).
    b. You have two choices here. You can push the slider up to deliver a set amount of base (and risk over-shooting the neutralization point) or you can press the button to deliver base dropwise. This will take practice. You can deliver a larger volume of base initially and then switch to dropwise as you approach the endpoint (neutralization).
    c. The solution will flash pink when you are getting close. You're looking for a FAINT pink color. You'll still be able to see the magnetic stir bar spinning in the bottom of the flask.
6. When you think you've reached the endpoint, calculate the molarity of the base by using $M_aV_a = M_bV_b$ (found in Table T). You'll take the Total Volume of Base as your M_b.

If you get it right, the simulation will say 'Correct!'. If you overshoot the endpoint the simulation will tell you you're incorrect and you should try it again.

Assignment

Complete the titration simulation until you get the ‘correct’ message. Then take a screenshot of your completed titration and attach it to a Google Doc to share with me.

In addition, please answer the following questions.

1. What volume of a 0.20 M solution of HCl will be required to neutralize 10. milliliters of a 0.60 M solution of KOH?
2. As the concentration of a KOH solution increases, the number of moles of HCl needed to neutralize the KOH solution
    a. Increases
    b. Decreases
    c. Remains the same
3. What is the molarity of a nitric acid solution (HNO_3), if 20.0 mL of the solution is needed to exactly neutralize 10.0 mL of a 1.67 M NaOH solution?
4. Pure water containing phenolphthalein will change from colorless to pink with the addition of
    a. KCl
    b. HCl
    c. HOH
    d. KOH
5. What is the molarity of a NaOH solution if it takes 100. mL of NaOH to completely neutralize 50. mL of 0.10 M H_2SO_4?