Neutralization

Acids can neutralize bases and bases can neutralize acids. Combining an acid (H^+ functional group) with a base (OH^- functional group) in the correct proportions produces salt and water.

$$\mathbf{HCl + NaOH \rightarrow H^+ + Cl^- + Na^+ + OH^- \rightarrow NaCl + H_2O}$$

Materials

Hydrochloric acid (HCl)
Sodium hydroxide (NaOH)
Medium beaker (100 mL) - 2
Pipette
pH indicator (universal indicator or bromothymol blue)
Graduated cylinder (50 mL)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Universal indicator															
Bromothymol blue															

Procedure

1. Obtain 25 mLs of hydrochloric acid from the supply table. Use the graduated cylinder to measure the amount of acid. Pour the acid carefully.
2. Pour the acid into the 100 mL beaker.
3. Carefully rinse the graduated cylinder.
4. Obtain 25 mLs of sodium hydroxide from the supply table. Use the graduated cylinder to measure the amount of base.
5. Pour the sodium hydroxide into the second empty 100 mL beaker. Rinse the graduated cylinder.
6. Add 4 or 5 drops of the pH indicator to the beaker containing sodium hydroxide and the beaker containing hydrochloric acid. Record the color of the solution.
   Color of HCl solution with added pH indicator _____ pH indicated _____
   Color of NaOH solution with added pH indicator _____ pH indicated _____
   pH indicator used _____
7. Use the pipette to add NaOH to the beaker of acid. Add the base drop by drop and swirl the beaker after each added drop. Continue adding drops until a neutral pH is reached. The pH indicator color will start to change as you add base. Be careful! If you add the base too quickly you will over shoot your pH 7 target!

How many drops of NaOH were required to neutralize the acid solution?

_____ drops

You are not very patient. Rather than add the base drop by drop you squirt in a full pipette of base. Your solution is a pH 6 and you squirt in another full pipette of NaOH. The color indicator changes dramatically and now the pH of the solution is pH 9. What do you do? Your instructor wants to see your neutralized solution.

Why is it important to add the base drop by drop, i.e., why is it so easy to over shoot pH 7?

What are the products of the neutralization reaction?