## Acid Base Neutralizations

When a traditional acid and base react together, the two products will be water and salt. If you have forgotten the definition for salt, refer to your book as you attempt to write the reaction. These reactions are another type of stoichiometry reaction, so remember our first two rules of Stoich:

Rule 1 – Write and balance the equation
Rule 2 – If you ain't got moles... get 'em.

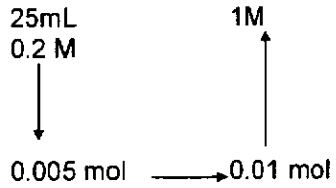
The new piece here is to incorporate molarity as it refers to the acid or the base. This is the same thing that we did in the last unit with solution stoichiometry. There is nothing new here, just a bringing together two types of problems that we have done before: HW #1 writing acid-base reactions and solution stoichiometry.

Example:

25 mL of 0.2 M sulfuric acid are required to neutralize 10 mL of sodium hydroxide. What is the molarity of the base?

Step 1: $H_2SO_4 + 2\ NaOH \rightarrow 2\ H_2O + Na_2SO_4$

Step 2:




The first conversion, determining the number of moles of sulfuric acid, is accomplished using the molarity equation: mol = MV.

The second conversion, determining moles of sodium hydroxide, is accomplished using the molar ratio from the balanced equation. For the conversion from sulfuric acid to sodium hydroxide, the ratio is 2 : 1 or
(2 mol NaOH / 1 mol $H_2SO_4$)

The last conversion, from mol sodium hydroxide to molarity, is also accomplished using the molarity equation: M = mol / V. (M = 0.01 mol NaOH / 0.01 L = 1 mol/L)

Answers to HW #1 and HW #2:

HW #1 – Part III
1. pH = 1 pOH = 13
2. pH = 11 pOH = 3
3. pH = 2.3 pOH = 11.7
4. pH = 11.7 pOH = 2.3
5. pH = 10.5 pOH = 3.5
6. pH = 10.5 pOH = 3.5
7. pH = 4.9 pOH = 9.1
8. pH = 11.3 pOH = 2.7
9. pH = 0.3 pOH = 13.7
10. pH = 13.7 pOH = 0.3
11. $[H^+]$ = 0.01 M $[OH^-]$ = 1E-12 M
12. $[H^+]$ = 3.98E-6 M $[OH^-]$ = 2.5E-9 M
13. $[H^+]$ = 1E-7 M $[OH^-]$ = 1E-7 M
14. $[H^+]$ = 1E-5 M $[OH^-]$ = 1E-9 M
15. 5E-6 mol sulfuric acid

HW #2
1. M = 2.2 mol/L
2. M = 0.14 mol/L
3. M = 0.324 mol/L
4. M = 0.046 mol/L
5. V = 0.1 L
6. M = 0.045 mol/L
7. M = 0.0194 mol/L
8. M = 0.123 mol/L
9. M = 0.752 mol/L 2.7%HCl
10. M = 0.792 mol/L 4.72% $HC_2H_3O_2$