Name: _____ Date: _____ CHEM 1A

Acid-Base Titrations & Redox Reactions (Chapter 4 Pt 2)

I. **Big Idea**

Previously, we've talked about precipitation reactions and how they're useful to us in lab. Today we're going to discuss two more types of reactions: **acid-base reactions** & **redox reactions.** Before we get there, let's define some terms.

The general reaction between an acid and a base is:

i.e

Arrhenius definition of "Acid" -

Arrhenius definition of "Base" -

II. **Acid-Base Titrations**

What is a titration?

1. Determine the concentration of NaOH if 10.0 mL of the solution took 11.5 mL of 2.0 M HCl to reach the equivalence point in a titration.

2. How many milliliters of 0.610 M NaOH solution are needed to neutralize 20.0 mL of a 0.245 M H_2SO_4 solution?

3. You are titrating a solution of sodium hydroxide of unknown concentration with a solution of phosphoric acid that has a concentration of 0.300 M. Starting with 29.0 mL of the sodium hydroxide solution, you use 16.8 mL of the acid to titrate the base to completion. Calculate the concentration of the sodium hydroxide solution.

4. A 0.350-g sample of an acid, HX, requires 25.4 mL of a 0.140 *M* NaOH solution for complete reaction. Calculate the molar mass of the acid.
   (A) 42.3 g/mol (B) 68.4 g/mol (C) 98.4 g/mol (D) 121.3 g/mol
   (E) none of these

III. Redox Reactions

Reduction –

Oxidation –

Oxidation Agent

Reducing Agent

5. Which of the following reactions does not involve oxidation-reduction?
   (A) $MnO_2 + 4HI \rightarrow I_2 + 2H_2O + MnI_2$
   (B) $LiOH + HCl \rightarrow H_2O + LiCl$
   (C) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
   (D) $Mg + 2HI \rightarrow MgI_2 + H_2$
   (E) All the above are oxidation-reduction reactions

6. In the following reaction, which species is the reducing agent?
   $3Cu + 6H+ + 2HNO_3 \rightarrow 3Cu^{2+} + 2NO + 4H_2O$
   a. Cu^{2+} b. HNO_3 c. Cu d. NO e. H^+

7. Identify the oxidation numbers of all of the elements in the following equation as well as indicate which element was oxidized and which was reduced.

   $2Al(s) + 3CuSO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3Cu(s)$

IV. Balancing Redox Reactions in Acidic or Basic Solution

8. Balance the following equation in acidic solution. When the following reaction is balanced in acidic solution, what is the coefficient of water?
   $Zn(s) + NO_3^-(aq) \rightarrow Zn^{2+}(aq) + NH_4^+(aq)$

9. Balance the following reaction occurs in aqueous acid solution. What is the coefficient of NO_3^-?
   $NO_3^- + I^- \rightarrow IO_3^- + NO_2$

10. Balance the following equation in basic solution and determine the coefficient of OH- and its location (right side or left side) in the equation. Also identify the oxidizing and reducing agents in the reaction.
    $Ce(s) + PO_4^{3-}(aq) \rightarrow HPO_3^{2-}(aq) + Ce(OH)_3(s)$