AP Chemistry

Dr. Wilhelm

**Chapter Four Reading Guide:**

**Stoichiometry: Quantitative Information about Chemical Reactions**

*On a separate piece of paper, write a response to the following reading prompts while reviewing chapter four of your textbook.*

**Mass Relationship in Chemical Reactions, Limiting Reactants & Percent Yield**

1. What is stoichiometry and how does this relate to the coefficients in a balanced chemical reaction? What is the importance of understanding this relationship in the real world setting?
2. Identify the steps involved with setting up and solving a stoichiometry problem for a balanced reactions ( mass to mass relationship). What is meant by the term, **stoichiometry factor** (also known as mole ratio)?
3. The author also suggests using an “amounts table” for organizing your calculations. Review this set-up. We will be using this for various types of calculations throughout the year.
4. Interactive 4.1 is a nice summary problem. Set up and solve this problem with the guidelines given.
5. Define the term **limiting reactant**. What role does the limiting reactant play in a reaction?
6. What is meant by the term excess reactant?
7. Summarize the steps used to determine the limiting reactant in a chemical reaction, the amount of product produced and the amount of excess reactant available. Observe how this can be easily presented in an amounts table.
8. Interactive 4.2 is very helpful to review, as is problem solving tip 4.2. Take time to read these.
9. Define the terms theoretical yield and actual yield. Why is the actual yield generally less than expected from the theoretical yield?
10. What is **percent yield** and how is it determined?

**Chemical Equations and Chemical Analysis**

1. Review the discussion of quantitative analysis of a mixture and example 4.3. Thinking back to our precipitation labs , how could we apply this technique to determine the mass of our precipitate?
2. Quantitative analysis can be used to determine the formula for a chemical compound. Review the process as it applies to combustion reactions (figure 4.7 and example 4.4). Describe the molar relationship of CO2 and H2O to the original organic compound (CxHy).

**Measuring Concentrations of Compounds in Solution**

1. Define Molarity and distinguish the role of the solute and solution in this relationship.
2. How does molarity (solution concentration) relate to aqueous system containing ions? For example, what is the concentration of magnesium and nitrate ions in a 1M Mg(NO3)2 solution?
3. Review the math relationships that are required to determine the mass of solute required to prepare a solution of known volume and concentration. With this understanding, how many grams of NaOH are required to prepare a 250 ml of a 1.5M solution?
4. Figure 4.9 describes the steps involved in preparing a solution. Identify the glassware used in this process and the steps as defined by the three pictures and descriptions.
5. Understanding dilutions and dilution series is very useful and will be applied in the laboratory. While the textbook goes into great detail to describe the math behind dilutions, the relationship can be presented as easily as: M1V1=M2V2. Use this equation to determine the concentrations of K2Cr2O7, as described in figure 4.10. Did you get the same answer as given by the author?

**pH, a Concentration Scale for Acids and Basis**

1. In this section, the textbook described pH in terms of H+ concentration. Note that [ ] is used to describe molarity. What is the relationship of [H3O+] and pH?

**Stoichiometry of Reactions in Aqueous Solution**

1. Solution stoichiometry incorporates the role of solution concentration (molarity) into the stoichiometric relationships of an aqueous reaction. Review the strategy map 4.9 and the example problem 4.9. With that in mind, complete the “check your understanding” problem at the bottom of example 4.9.
2. Titration incorporates the use of burets to dispense very precise amounts of solution. With that in mind, how is titration used for quantitative analysis of aqueous reactions?
3. What is meant by the term equivalence point?
4. Why is standardization of a solution important for titration?
5. Titration is often applied to acid/based reactions and redox reactions. While reviewing section 4.7, see if you can understand and explain how titration might be used for analysis of these types of aqueous reaction. Why is color change so important for these analysis?
6. What is spectrophotometry and how is it used as an analytical tool?
7. Distinguish between the terms transmittance and absorbance.
8. Define the relationship of absorbance and solution concentration as supported by the Beer-Lambert law.
9. What are the steps involved in spectrophotometric analysis and what is the purpose of the calibration plot? Review example 4.14 to appreciate how this works (we’ll conduct this same type of experiment in the lab).