Chem 101 Exam 2 Objectives

Part 1: Chemical Reactions

- Balance a chemical equation.
- Describe the difference between the meaning of coefficients and subscripts.
- Balance a chemical equation in standard form when the equation has decimal or fractional coefficients.
- Write an equation in formulas given that equation in words.
- Balance an equation and determine the sum of coefficients.

Part 2: Precipitation Reactions

- Explain the difference between a soluble and an insoluble solid and use the solubility rules (will be provided on the exam) to determine whether a given compound is soluble or insoluble.
- Predict the products of a chemical reaction given two aqueous salts **and** determine whether or not a precipitate will form when the two are combined.

  Ex. $Ba(NO_3)_2$ and Na_2SO_4 react to form…?

- Write a balanced molecular equation for a reaction between two aqueous salts.
- Write a balanced complete ionic equation for a reaction between two aqueous salts.
- Write a balanced net ionic equation for a reaction between two aqueous salts.
- Write balanced molecular, complete, and net ionic equations for reactions between a strong acid and a strong base.

  Ex. HNO_3 + NaOH react to form…?

Part 3: Stoichiometry

- Explain the meaning of a "mole ratio" in a chemical reaction and how this ratio distinguishes what we "need" to react.
- Determine the amount of product produced in moles or grams if we have some number of moles of one reactant and a sufficient amount of the other reactant.
- Determine the amount of one reactant in grams or moles needed to completely use up the other reactant if given the amount of one reactant in moles or grams.
- Define limiting and excess reactant.
- Determine the limiting reactant when presented with two amounts of reactants along with a balanced equation.
- Use the limiting reactant to determine the amount of product that is produced for a given equation.
- Determine the amount of excess reactant leftover after a chemical reaction takes place in both moles and grams.
- Demonstrate that a given process follows the law of conservation of mass – i.e. that the mass of substances present before the reaction is equivalent to the mass of substances present after the reaction.

Part 4: Solutions

- Use the molarity equation (M = mol/L) to solve simple concentration problems.
- Understand molarity at a conceptual level, including diluting solutions, mixing solutions, using stock solutions to create a solution of a particular concentration, etc.

Part 5: Stoichiometry Applications

- Perform stoichiometry problems similar to those in Part #3 if given the concentrations, volumes, or pressures of reactants.
- Determine the concentration of ions leftover (including limiting, excess, and spectator ions) if given the concentrations and volumes of reactants in a solution before the containers are combined.
- Apply the ideal gas law and other gas law relationships to stoichiometry problems.
- Determine the amount of acid or base required in a neutralization reaction (acid + base react to form water) given the concentration and volume of the acid or base.

Additional Notes:

- Be able to use these concepts to explain the meanings behind the lab activities and the lecture demonstrations.
- This is not an exhaustive list. Though this list represents topics we have covered, on the exam the questions may be asked in slightly different ways, ways requiring you to explain, or in ways that require you to apply what you have seen in a new situation.