**AP Chemistry Unit 3 Study Guide**

**Chemical Equations and Stoichiometry**

**Enduring Understandings and Essential Knowledge:**

EU 3.A: Chemical changes are represented by a balanced chemical equation that identifies the ratios with which reactants react and products form.

EK 3.A.1: A chemical change may be represented by a molecular, ionic, or net ionic equation.

EK 3.A.2: Quantitative information can be derived from stoichiometric calculations that utilize the mole ratios from the balanced chemical equations.

EK 3.B.1: Synthesis reactions are those in which atoms and/or molecules combine to form a new compound. Decomposition is the reverse of synthesis, a process whereby molecules are decomposed, often by the use of heat.

EK 3.B.2: In a neutralization reaction, protons are transferred from an acid to a base.

EK 3.B.3: In oxidation-reduction (redox) reactions, there is a net transfer of electrons. The species that loses electrons is oxidized, and the species that gains electrons is reduced.

EK 3.C.1: Production of heat or light, formation of a gas, and formation of a precipitate and/or a color change are possible evidences that a chemical change has occurred.

**AP Learning Objectives:**

LO 3.1: Students can translate among macroscopic observations of change, chemical equations, and particle views.

LO 3.2: The student can translate an observed chemical change into a balanced chemical equation and justify the choice of equation type (molecular, ionic, or net ionic) in terms of utility for the given circumstances.

LO 3.5: The student is able to design a plan in order to collect data on the synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions.

LO 3.6: The student is able to use data from synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions.

**Objectives for this unit:**

* Classify reactions as synthesis, decomposition, acid-base, and oxidation-reduction reactions
* Write and balance molecular, ionic, and net ionic equations
* Understand when to use ionic or net ionic equations
* Represent chemical changes using particle diagrams
* Calculate the theoretical yield for a chemical reaction
* Calculate percent yield for a chemical reaction
* Identify the limiting reactant and excess reactant in a chemical reaction
* Use molarity to describe the concentration of a solution
* Perform calculations using molarity (convert molarity to moles, to grams, to liters, etc.)
* Calculate the concentration of an unknown solution using titration data
* Identify the equivalence point of an acid-base titration
* Calculate the concentration of an unknown solution using gravimetric data
* Calculate the concentration of an unknown solution using Beer’s law
* Calculate the percent water in a hydrate using laboratory data

Resources to study:

1. Your lab handouts and lab write-ups (this is why you have carbon copies of all your labs!)
2. Textbook reading (Brown & Lemay):
   1. Chapter 3, sections 3.1 – 3.3 (pgs 77 – 86)
   2. Chapter 3, sections 3.6 – 3.7 (pgs 96 – 104)
   3. ALL of Chapter 4 (pgs 115 – 148)

-Exception: you do not need to know the activity series of metals yet.

1. Test prep book: pgs. 36 – 70 (for reference as you do practice problems)
2. Practice problems (Brown and Lemay):

Chapter 3 exercises (pgs 110 – 112): 3.65, 3.67, 3.71 – 3.77

Chapter 4 exercises (pgs. 150 – 157): 4.19, 4.25, 4.31, 4.37, 4.39, 4.41, 4.45, 4.49, 4.59b, **4.61 – 4.69, 4.79 – 4.89 (odd #s only),** 4.94

QUESTIONS IN BOLD ARE EXTRA IMPORTANT