Year Long Course Plan

Department: Science **Course: AP Chemistry 760/761**

Essential Learning Outcomes: After successfully completing this course, students will be able to:

1. Calculate moles, grams, ΔE, ΔH, Δs, equilibrium constants, pH, reaction rates, specific heat, and cell potential.
2. The student will have strong knowledge of introductory organic chemistry, acid/base equilibria, kinetics, electrochemistry, intermolecular forces, and molecular geometry and hybridization.
3. Use lab skills in the areas of titration, measurement of pH using different methods, organic synthesis, construction of an electrochemical cell, design of a kinetics lab, and testing of Le Chatlier's Principle.

Quarter 1	*Quarter 2*
The year will begin with a review of basic skills such as balancing equations, calculations of moles, grams, limiting reagent, and standard lab skills. Balancing of redox equations will be introduced here. A limiting reagent lab and a redox lab will be completed. **Chemical Bonding I: Basic Concepts** **Lewis Dot Symbols and Structures will be reviewed. The concept of resonance will be introduced as well as electronegativity and formal charge. Exceptions to the octet rule will be explained. (VSEPR THEORY)** **Chemical Bonding II** **Molecular geometry and dipole moments will be explored. Valence Bond Theory (VBT) will be introduced along with the concept of hybridization. Molecules containing double and triple bonds will be studied. Students will use the model kits to visualize the geometry.** **Intermolecular Forces** **Students will learn about London forces, dipole/dipole interactions, ion/dipole interactions, and hydrogen bonding. Students will graph trends such as boiling and melting points with and without hydrogen bonding.** **Chemical Equilibrium** **This important concept will be studied in detail. Students will learn how to write equilibrium constant expressions, do calculations concerning equilibrium, and use Le Chatlier's Principle. An equilibrium lab and a lab concerning Le Chatlier's Principle will be completed.**	**Organic Chemistry** **A study of the alkanes, alkenes, and alkynes will be undertaken. Students will also study aromatic compounds such as benzene and related substances. Organic modeling kits will be used in the investigation of organic functional groups. A synthesis of oil of wintergreen and aspirin will be completed in the lab.** **Acids and Bases I** **The study will begin with definitions of Arrhenius, Bronsted-Lawry, and Lewis acids and bases. The students will apply the definitions as the situation warrants. Acid/base properties of water and the strength of acids and bases will be studied in the lab. Ionization constants of weak acids and bases will be applied and pH values will be measured and calculated. The contribution of acid structure to acid strength will be explored as will the acid /base properties of salts.** **Calorimetry** **The concept of thermochemistry and the laws of thermodynamics will be introduced. Students will study entropy and use tables and lab experiments to find the value of ΔH°. Thermochemical equations will be used to find energy values for unknown equations. In their study of calorimetry, the students will experiment to find the specific heat values of metals using a calorimeter. Examples will be given of the heat of dilution and solution (students will feel the temperature change).**
Quarter 3	*Quarter 4*
Entropy, Free Energy, and Equilibrium **The students will expand upon the ideas learned in the study of enthalpy to include entropy and Gibb's Free**	**Acids and Bases II** **The initial concept of this chapter is the common ion effect. The students will learn how the addition of a**

Energy. Students will continue to use the Thermodynamic Data Tables in calculations and will relate the Gibb's Free Energy to the equilibrium constant of the reaction. **Kinetics** **In this unit, the students will study the rate of a reaction and factors that affect the rate. Students will learn to write a rate law from both data and reaction mechanisms. Concentration/time relationships will be studied in the lab as well as time and temperature relationships. Activation energy graphs will be plotted and investigated. The effect of a catalyst will also be studied in the lab.** **Electrochemistry** **This unit begins with a review of redox equations that leads into a study of Galvanic cells. The students will construct their own cells in the lab and calculate the cell potential. Spontaneity of reactions will be studied as will the effects of concentration on electromotive force. The students will learn about the various types of batteries and the problems caused by corrosion. The unit will end with a study of electrolysis.** **Colligative Properties** **The four Colligative properties will be presented and discussed and calculations will be practiced in this brief overview of the topic.**	**common ion has a large impact on the pH of a solution and the formation of a precipitate. The Henderson-Hasselbach equation will be used in calculations. The preparation and uses of buffer solutions will be studied next. The largest portion of the unit is dedicated to the study of titrations and the use of indicators to determine the endpoint of the titration.** **Ksp** **The concept of solubility of "insoluble" salts will be examined in this unit. Factors affecting the solubility such as a common ion and pH will be studied. The use of fractional precipitation to separate substances will be introduced.** **Nuclear Chemistry** **A brief study of nuclear particles and the balancing of nuclear equations will be conducted in this unit. Use of nuclear reactors for energy production will be discussed.** **Phase Diagrams** **The students will be taught how to read and interpret a phase diagram.** **Review** **Concepts from Honors and A.P. Chemistry will be reviewed as time permits.**