

The AP Chemistry course centers around six big ideas and seven science practices:

Big Ideas	Science Practices
1. <b>Structure of Matter</b> (Atoms, Elements, & Periodicity)	1. Drawing, explaining, and interpreting representations
2. <b>Bonding and Intermolecular Forces</b> (Structure and Properties of Matter)	2. Using mathematics and logical routines appropriately
3. <b>Chemical Reactions</b>	3. Asking and refining scientific questions
4. <b>Kinetics</b>	4. Designing and implementing data collection strategies
5. <b>Thermodynamics</b>	5. Analyzing and evaluating data
6. <b>Chemical Equilibrium</b>	6. Making predictions and justifying claims with evidence
	7. Connecting chemistry concepts across the big ideas.

### 1st Year Chemistry Pre-Requisites:

Chapter 1,2: Introduction to Chemistry, Scientific Method, Chemical & Physical Change

Chapter 3: Stoichiometry - Calculations with Chemical Formulas and Equations  
- Measurement, Dimensional Analysis

\*Laboratory Experiments:

Lab Activity - 17 Stations Activity

Lab Activity - Relative Mass Puzzle

### **BIG IDEA 1 - STRUCTURE OF MATTER: ATOMS, ELEMENTS AND PERIODICITY**

**The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.**

Chapter 6: Electronic Structure of Atoms

Chapter 7: Periodic Properties of Elements - Periodic Table and Periodicity

\*Required Topic: Mass Spectrometry and Spectroscopy

\*Required Laboratory Experiments:

Lab #3: Determination of the Concentration of a Copper(II) Sulfate Solution Unknown

Lab #4: Flinn Inquiry Investigation #1: Analysis of Food Dyes in Beverages

**BIG IDEA 2 - CHEMICAL BONDING & INTERMOLECULAR FORCES**

**Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.**

Chapter 8: Chemical Bonding

Chapter 9: Molecular Geometry and Bonding Theories

Chapter 10: Gases & Kinetic Molecular Theory

Chapter 11: Intermolecular Forces of Attraction; Phases of Matter - Solid, Liquid, Gases

Chapter 13: Properties of Solutions

\*Required Laboratory Experiments:

Lab Activity: Molecular Geometry (Dry-Lab)

Lab #6A: Determination of Molar Volume of Unknown Gas

Lab #6B: Determination of Molar Mass of Volatile Liquids

Lab #7: Flinn Inquiry Investigation #5: Separation of Dye Mixture Using Chromatography

**BIG IDEA 3 - CHEMICAL REACTIONS**

**Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.**

Chapter 4: Aqueous Reactions and Solution Chemistry

Chapter 20: Electrochemistry

\*Required topics: Reaction Prediction, Qualitative Analysis

\*Required Laboratory Experiments

Lab #1: Flinn Scientific AP Exp. 14 - Separation and Qualitative Determination of Cations and Anions

Lab #2: Flinn Scientific AP Exp. 16 - Gravimetric Analysis of a Metal Carbonate

Lab #15: Flinn Scientific AP Exp. 21 - Measurements Using Electrochemical Cells

**BIG IDEA 4 - CHEMICAL KINETICS**

**Rates of chemical reactions are determined by details of the molecular collisions.**

Chapter 14: Chemical Kinetics

\*Required Topics:

- Factors Affecting Rates
- Collision Theory
- Reaction Mechanisms
- Catalysts

\*Required Laboratory Experiments:

Lab Activity: Kinetics Computer Lab

Lab #8: Flinn Inquiry Investigation #11: Kinetics of Crystal Violet Fading

### **BIG IDEA 5 - CHEMICAL THERMODYNAMICS**

**The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.**

Chapter 5: Thermochemistry: 1st Law of Thermodynamics

Chapter 19: Chemical Thermodynamics: 2nd, 3rd Law of Thermodynamics

\* Required Topics:

- Heat, Temperature and Kinetic Energy
- Work, Calorimetry and Conservation of Energy
- Breaking and Making Chemical Bonds
- Enthalpy, Entropy and Free Energy

\* Required Laboratory Experiments:

Lab (1st Year): Thermochemistry: Hess's Law - Calculating the Enthalpy of Dissolution

Lab (1st Year): Calorimetry - Measuring the Molar Heat of Fusion

Lab #5: Flinn Inquiry Investigation #12: Designing a Hand Warmer

### **BIG IDEA 6 - CHEMICAL EQUILIBRIUM**

**Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.**

Chapter 15: Chemical Equilibria

Chapter 16: Acid-Base Equilibria

Chapter 17: Aqueous Equilibria & Buffers

\* Required Topics:

- Equilibrium
- Le Chatelier's Principle
- Acid-Base Equilibria
- Gibb's Free Energy and Equilibrium

\* Required Laboratory Experiments:

Lab #9: Flinn Scientific AP Exp. 17 - The Determination of  $K_{eq}$  for  $FeSCN_2^+$

Lab #10: Flinn Inquiry Investigation #13: Applications of LeChatelier's Principle

Lab #11: Flinn Scientific AP Exp. 6 - Acid-Base Titrations

Lab #12: Flinn Scientific AP Exp. 10 - Determination of  $K_a$  of Weak Acids

Lab #13: Flinn Scientific AP Exp. 19 - Preparation and Properties of Buffer Solutions

Lab #14: Flinn Inquiry Investigation #16: Properties of Buffer Solutions