**AP Chemistry Syllabus**

Mrs.Welch

**Course Description**- AP Chemistry meets for 90 minutes five times each week. Students should expect to spend an average of one hour outside of class per day on chemistry. Students are recommended to read the chapter in advance and outline the material in their notes as well as write definitions of key terms from the reading. This will provide more time in class to cover the high points of theory, make connections between related topics, and to discuss problem solving strategies and work calculations related to the material. This course utilizes the four big ideas outlined in the AP Chemistry Curriculum Framework published by the College Board as listed below. It is the ultimate goal of this course that students will attain mastery of the Science Practices as outlined by the Curriculum Framework and listed below to illustrate a broad and practical understanding and application of chemical knowledge.

| **Four Big Ideas** |
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| BIG IDEA 1: SCALE, PROPORTION, AND QUANTITY (SPQ)  Quantities in chemistry are expressed at both the macroscopic and atomic  scale. Explanations, predictions, and other forms of argumentation in  chemistry require understanding the meaning of these quantities, and the  relationship between quantities at the same scale and across scales. |
| BIG IDEA 2: STRUCTURE AND PROPERTIES (SAP)  Properties of substances observable at the macroscopic scale emerge  from the structures of atoms and molecules and the interactions between  them. Chemical reasoning moves in both directions across these scales.  Properties are predicted from known aspects of the structures and  interactions at the atomic scale. Observed properties are used to infer  aspects of the structures and interactions. |
| BIG IDEA 3: TRANSFORMATIONS (TRA)  At its heart, chemistry is about the rearrangement of matter. Understanding  the details of these transformations requires reasoning at many levels as  one must quantify what is occurring both macroscopically and at the atomic  level during the process. This reasoning can be as simple as monitoring  amounts of products made or as complex as visualizing the intermolecular  forces among the species in a mixture. The rate of a transformation is also of  interest, as particles must move and collide to initiate reaction events. |
| BIG IDEA 4: ENERGY (ENE)  Energy has two important roles in characterizing and controlling chemical  systems. The first is accounting for the distribution of energy among the  components of a system and the ways that heat exchanges, chemical  reactions, and phase transitions redistribute this energy. The second is  in considering the enthalpic and entropic driving forces for a chemical  process. These are closely related to the dynamic equilibrium present in  many chemical systems and the ways in which changes in experimental  conditions alter the positions of these equilibria. |

**Laboratory-** Students will be expected to complete all laboratory activities during class time. Students will adhere to the safety guidelines as outlined in the safety contract at all times or this will be cause for removal from the laboratory and result in a zero grade. Students will follow all laboratory instructions from the teacher and will complete a lab report using the format given by Mrs.Welch for each laboratory report. If a student is absent and misses a lab, students will have 1 week from the first date absent to schedule a make-up lab. Labs missed and not rescheduled with the teacher within a week from the original missed date will result in a zero grade.

**Grades-**

Grades in the course will be based on the following weighted categories:

Exams and Quizzes 50%

Labs 25%

Homework 25%

And Classwork

The grading scale used will be the following:

A+ 97 - 100

A 93 - 96 C 73 - 76

A- 90 - 92 C- 70 - 72

B+ 87 - 89 D+ 67 - 69

B 83 - 86 D 63 - 66

B- 80 - 82 D- 60 - 62

C+ 77 - 79 F 0 – 59

The teacher reserves the right to change student grades as she sees fit based on her discretion in unique cases. Unit exams will be strictly timed and consist of questions from previous AP Chemistry exams as well as AP level questions. This will help prepare students for the types of questions and time constraints they will encounter when they take the AP Chemistry Exam in May.

**Late Work and Make-Up Work-** Students who are absent will have 1 week from the date they were absent to request their make-up work and will have one week from the date they have received their missing assignment to submit missing assignments for full credit. AP Chemistry moves at a fast pace thus, the assignments need to be completed in a timely manner. A 10% deduction per week that the assignment is late will be added for each assignment. Any late assignment must be submitted before each unit test or it will no longer be accepted. If you are going to miss a test, quiz or lab, please notify me ahead of time if possible so proper arrangements can be made.

**Suggestions for Success in AP Chemistry-**

* Read chapters as they are assigned or before. The more general information you can accumulate regarding topics, the more you will be able to see correlations and relationships of concepts on exams and in lab activities.
* Take notes when you are reading the chapters and leave room to fill in details in your notes when we discuss the material in class. If you already have a basic understanding of the key terms in the chapter, it will be much easier to grasp what is discussed in class.
* Write detailed sample calculations in your notes from the reading so that you have good, concrete examples to refer back to when we start working on more complex problems in a chapter or unit.
* Study some chemistry everyday and make it a habit. If you spend a little time each day, you will not have to try to catch up and cram before tests. We will be moving at a rapid pace and covering many difficult concepts that can be overwhelming if you get behind. This is not a class in which you want to procrastinate!

**AP Chemistry Unit Outlines:**

| **Units** | **AP Exam Weighting** |
| --- | --- |
| Unit 1: Atomic Structure and its Properties | 7-9% |
| Unit 2: Chemical Bonding and Bonding Theories | 7-9% |
| Unit 3: Intermolecular Forces and Properties | 18-22% |
| Unit 4: Chemical Reactions | 7-9% |
| Unit 5: Kinetics | 7-9% |
| Unit 6: Thermodynamics | 7-9% |
| Unit 7: Equilibrium | 7-9% |
| Unit 8: Acids and Bases | 11-15% |
| Unit 9: Applications of Thermodynamics | 7-9% |

**AP Chemistry Course Schedule Unpacked:**

**Unit 1: Atomic Structure and its Properties (2 Weeks)**

* Measurement/Significant Figures
* Composition of Mixtures
* Mole Relationships and Molar Mass
* Atomic theory
* History of the Atom/Atom Models
* Atomics Structure and Light (de Broglie)
* Symbols and Formulas
* Periodic Table and Trends
* Nuclear Chemistry (Decay equations and Fission and Fusion)
* Spectroscopy and PES (Beer-Lambert Law)

**Unit 2: Chemical Bonding and Bonding Theories (2-3 Weeks)**

* Ionic Bonding and Lattice Energy
* Metallic Bonds (alloys)
* Covalent Bonding
* Resonance Structures and Formal Charge
* VSEPR Theory
* Bond Hybridization
* Molecular Orbital Theory
* Bond Energy and Enthalpy
* Coulomb’s Law
* Intramolecular Forces

**Unit 3: Intermolecular Forces and Properties (2-3 Weeks)**

* Intermolecular Forces
* Properties of Solids
* Solids, Liquids and Gases
* Gas Laws
* Ideal Gas Law
* Kinetic Molecular Theory (Maxwell-Boltzmann distribution)
* Deviation from Ideal Gas Law
* Solutions and Mixtures
* Separations of mixtures
* Solubility
* Spectroscopy and the Electromagnetic Spectrum
* Photoelectric Effect
* Beer-Lambert Law

**Unit 4: Chemical Reactions (1-2 weeks)**

* Types of Reactions and Balancing
* Net Ionic Equations
* Physical and Chemical Changes
* Stoichiometry
* Titrations and Calculations
* Solubility Rules
* Redox and Acid/Base Reactions Introduction

**Unit 5-Kinetics (2-3 Weeks)**

* Reaction Rates
* Rate Law
* Concentration Changes over time
* Elementary Reactions
* Collision Model
* Reaction Energy Profile
* Reaction mechanisms
* Steady-State Approximation
* Multistep Reaction energy profile
* Catalysis

**Unit 6: Thermodynamics (1-2 Weeks)**

* Endothermic Vs Exothermic Processes
* Energy Diagrams
* Heat Transfer and Thermal Equilibrium
* Heat Capacity and Calorimetry
* Energy of Phase changes
* Enthalpy of reactions
* Bond Enthalpies
* Enthalpy of formation
* Hess’s Law

**Unit 7: Equilibrium (2-3 weeks)**

* Introduction to Equilibrium
* Direction of Reversible Reactions
* Reaction Quotient and Equilibrium Constant
* Calculating the Equilibrium Constant
* Magnitude of the Equilibrium Constant
* Properties of the Equilibrium Constant
* Calculating Equilibrium Concentrations
* Representations of Equilibrium
* Le Chatelier's Principle and reaction quotient
* Solubility Equilibria
* Common-Ion effect
* Ph and Solubility
* Free energy of dissolution

**Unit 8: Acids and Bases (2-3 weeks)**

* Intro to Acids and Bases
* PH and POH of strong acids and bases
* Weak Acid and Base Equilibria
* Acid-Base Reactions and Buffers
* Acid-Base Titrations
* Molecular Structure of Acids and Bases
* PH and PKa
* Properties of Buffers
* Henderson-Hasselbalch Equation
* Buffer Capacity

**Unit 9: Applications of Thermodynamics (1-2 Weeks)**

* Intro to Entropy
* Absolute Entropy and entropy change
* Gibbs free energy and thermodynamic favorability
* Thermodynamic and Kinetic Control
* Free Energy and Equilibrium
* Coupled Reactions
* Galvanic (Voltaic) Cells
* Cell Potential and Free Energy
* Electrolysis and Faraday’s Law