

AP Chemistry

Mrs. Masengil

amasengil@mcmminnschools.com

Required Materials Lab Notebook • 3 Ring Binder with Dividers • Loose Leaf Paper
Pens/Pencils/Highlighter

Textbook Zumdahl, Steven S. and Susan A. Zumdahl. (2003). *Chemistry* (6th edition).
Boston, Massachusetts: Houghton Mifflin Company.

Course Description Welcome to AP Chemistry! During this year you will have the opportunity to learn about chemistry in much more depth than you did in first year chemistry. We will explore in much greater depth concepts you have already learned as well as new material that will build on your prior knowledge. Ultimately, this class seeks to prepare you for the AP exam in the spring and give insight in to what you can expect from a college chemistry class.

This course will require that you take responsibility for your learning. This entails completing the outside reading and problems so that we may use class time efficiently. Self-discipline is key to success.

Big Ideas There are six big ideas as defined by the AP Chemistry curriculum framework supplied by the College Board.

- 1) 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.
- 2) 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.
- 3) Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.
- 4) Rates of chemical reactions are determined by details of the molecular collisions.
- 5) The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.
- 6) 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.

COURSE PACING

Big Idea	Unit	Unit Topic	Time Frame
2	1	<p>The Fundamentals</p> <ul style="list-style-type: none"> · Scientific Method · Classification of Matter · Separation Science · Physical and Chemical Properties · Temperature and Density · Elements · Math Review · Units of Measurement · Unit Conversion · Uncertainty in Measurement · Length, Volume, Mass · Density and Specific Gravity 	
1	2, 7, 18	<p>Nuclear and Atomic Structure</p> <ul style="list-style-type: none"> · Subatomic Particles · The Nucleus · Mass Spectroscopy and Isotopes · Nuclear Stability · Atomic Structure · Rutherford Experiment · Cathode Ray Experiment · Electromagnetic Radiation · Quantization of Energy · Photoelectric Effect · Bohr Atom · Orbital Model of the Atom · Aufbau Diagram · Paramagnetism · Quantum Model 	

1	7, 8	<p>Periodicity and Introduction to Bonding</p> <ul style="list-style-type: none"> · Atomic Properties · Periodic Law · Elemental Properties · Types of Bonds · Metallic Bonding · Alkali Metals · Metals vs. Non Metals · Transition Metals and Oxidation States · Ionic Bonding/Potential Energy · Energy of Formation of Ionic Compounds · Lattice Energy 	
2	8, 9, 19, 20, 21, 22	<p>Covalent Bonding and Molecules</p> <ul style="list-style-type: none"> · Types of Covalent Bonds · Nonpolar Covalent Bonds · Polar Covalent Bonds · Coordinate Covalent Bonds · Lewis Structures · Resonance · Hybridization · Molecular Geometry · Energy Effects on Molecules · Isomerism · Functional Groups · Interaction of Functional Groups · Classification of Molecules · Intermolecular Interactions · Dipole Moments · Dielectric Constants · Properties of Metallic, Molecular, Macromolecular, Ionic Compounds 	

2	22	<p>Organic Chemistry</p> <ul style="list-style-type: none"> · Properties and Bonding in Carbon Compounds <ul style="list-style-type: none"> - Intro to organic chemistry: hydrocarbons and functional groups. Physical and chemical properties of simple organic compounds. · Hydrocarbons <ul style="list-style-type: none"> - Petroleum - Fractional Distillation - Cracking - Alkanes - Alkenes - Alkynes - Benzene Series - General Formulas - Structural Formulas - Saturated/Unsaturated Compounds · Nomenclature <ul style="list-style-type: none"> - Alkyl Groups - IUPAC Nomenclature - Isomers · Other Organic Compounds <ul style="list-style-type: none"> - Alcohols - Aldehydes - Ketones - Acids - Esters - Ethers - Amines - Polymers · Organic Reactions 	
3	3,4	<ul style="list-style-type: none"> · Predicting Products <ul style="list-style-type: none"> - Naming Compounds - Balancing Chemical Equations - Types of Chemical Equations - Types of Chemical Reactions - Predicting Based on Stability - Predicting Based on Type - Chemical Reactivity 	

3	3, 4	<ul style="list-style-type: none"> · Measurement and Stoichiometry <ul style="list-style-type: none"> - Law of Constant Composition - Using Moles to find a Quantity - Stoichiometry - Limiting Reactants - Using Density - Solution Terms - Solution Stoichiometry 	
5	6, 16	<ul style="list-style-type: none"> · Thermochemistry <ul style="list-style-type: none"> - Introduction - Conservation of Energy - State Functions - Potential Energy - Kinetic Energy - Calorimetry - Heat of Fusion - Heat of Vaporization - Specific Heat - Heat of Dilution - Heat of Solution - Hess's Law - Bond Dissociation Energies - Gibbs Free Energy Equation 	
2	5, 10	<ul style="list-style-type: none"> · Gases, Liquids, and Solids <ul style="list-style-type: none"> - Real Gases vs Ideal Gases - Ideal Gas Equation - Gases Collected over Water - Kinetic Molecular Theory - Van Der Waals Equation - Molecular Speeds - Diffusion and Effusion - Molecular Theory related to Phase - Phase Changes - Entropy - Heating and Colling Curves - Interfaces - Pressure - Vapor Pressure - Boiling Point and Freezing Point - Vapor Pressure Curves - Phase Diagrams - Energy Change and Phase Changes - Viscosity - Surface Tension - Types of Solids and Crystal Structure 	

2	11	<ul style="list-style-type: none"> • Solutions <ul style="list-style-type: none"> - Types of Solution - Electrolytes - Miscibility and Immiscibility - Dissolution - Solubility Terms - Solubility Curves - Henry's Law - Concentration Terms - Dilution Problems - Solution Stoichiometry - Raoult's Law - Colligative Properties - van't Hoff Factor - Osmosis - Deviation from Raoult's Law - Colloids 	
4	12	<ul style="list-style-type: none"> • Kinetics <ul style="list-style-type: none"> - Rates Relationship to Collisions - Reaction Mechanism - Activation Energy - Nature of Reactants and Interfacial Surface Area - Temperature and Pressure Effects on Rates - Catalysts - Potential Energy Diagrams - Activated Complex and Intermediates - Arrhenius Equation - Maxwell-Boltzman Diagram - Average Rate - Rates Relationship to Stoichiometry - Graphical Determination of Instantaneous Rate - Rate Laws - Mechanisms - Order of Reactions - Calculations Based on Order 	
6	13	<ul style="list-style-type: none"> • Equilibrium <ul style="list-style-type: none"> - Reversible Processes - Types of Systems - Kinetics Relationship to Equilibrium - Equilibrium Expressions - Equilibrium Constants - LeChatelier's Principle - Equilibrium Calculations 	

6	14, 15	<ul style="list-style-type: none"> - Equilibrium Stresses - Molar Solubility - Common Ion Effects - Reaction Quotients <p>·Acids, Bases, and Salts</p> <ul style="list-style-type: none"> - Dissociation vs Ionization - Preparation of Acids, Bases, and Salts - Classification of Acids and Bases - Bronsted-Lowry Theory - Degree of ionization - Equilibrium Constants - Weak Acids and Bases - Binary Acids vs Oxyacids - Determination of Acid and Bases Properties based on Structure - Ionization of Water - pH and pOH - Acid-Base Stoichiometry - Ionization Calculations of Weak Acids - Henderson-Hasselbalch Equation - Titration Calculations - Indicators - Types of Salts - Dissociation of Salts and Buffers 	
3	17	<p>· Electrochemistry and Thermodynamics</p> <ul style="list-style-type: none"> - Oxidation and Reduction - Substances gaining Potential - Types of Electrochemical Cells - Voltaic Cells - Cell Potentials - Concentration Dependence of E - Nernst Equation - Cell Potentials and Equilibrium - Metal Electrodes - Reference Electrodes - Indicator Electrodes - Application of Voltaic Cells - Electrolysis - Faraday's Law - Electrolytic Cells - Order of Reduction - Application of Electrolytic Cells - Gibbs Free Energy Equation - Relationship of Equilibrium and Q - Relationship to E 	

Grading Your grade will be calculated on a weighted average as follows:

Tests	50%
Classwork/Quizzes	15%
Homework	10%
Lab	25%

Laboratory Lab work is an essential part of chemistry and as such will count as 25% of your grade. A laboratory notebook is required for you to record your lab work. AP Chemistry lab reports will follow a specific format. You will be given a lab sheet that will contain prelab and post lab work questions. **Late lab; will not be accepted.**

Daily Assignments This will include warm-ups, class work, and quizzes.

Homework I will collect homework from you periodically throughout the course. This will include problem sets as well as discussion of reading assignments. Vocabulary lists will also be given to you throughout the year.

Tests The exams in this course will be rigorous in nature and will generally be given with each unit. Tests count as 50% of your grade.

Makeup Work I cannot stress enough that you are entirely responsible for taking care of work missed from an excused absence. You will not have an indefinite time frame to make this work up. All assignments including quizzes and tests must be made up within 5 days of an excused absence. It is in your best interest to miss as little as possible during this course. I understand that illness and emergencies come up, but if at all possible... be at school.

Behavior Expectations Bad behavior should not be an issue in an AP Chemistry class and I do not expect to have any problems with this. The best behavior that students need to adopt is one of self-discipline and responsibility. Do not procrastinate on your assignments.

AP Chemistry Curriculum Requirements**Page(s)**

CR1 Students and teachers use a recently published (within the last 10 years) college-level chemistry textbook.	
CR2 The course is structured around the enduring understandings within the big ideas as described in the AP Chemistry Curriculum Framework.	
CR3a The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 1: Structure of Matter	
CR3b The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 2: Properties of Matter-characteristics, states, and forces of attraction.	
CR3c The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 3: Chemical Reactions	
CR3d The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 4: Rates of Chemical Reactions	
CR3e The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 5: Thermodynamics	
CR3f The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 6: Equilibrium	
CR4 The course provides students with the opportunity to connect their knowledge of chemistry and science to major societal or technological components (e.g. concerns, technological advances, innovations) to help them become scientifically literate citizens.	
CR5a Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25% of instructional time.	
CR5b Students are provided the opportunity to engage in a minimum of 16 hands-on laboratory experiments integrated throughout the course while using basic laboratory equipment to support the learning objectives listed within the AP Chemistry Curriculum Framework.	
CR6 The laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Chemistry Curriculum and Framework. At minimum, six of the 16 labs are conducted in a guided inquiry-format.	
CR7 The course provides opportunities for students to develop, record, and maintain evidence of their verbal, written, and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written, and graphic representations.	