Pre-AP Chemistry Syllabus

Instructor: Jeff Taylor **Contact Information:** jtaylor@fusd1.org

Course Overview: Pre-AP Chemistry will be one of the hardest courses you will take in high school. Many sophomores struggle with the course because it is the first time they have ever had to apply mathematics to real world problem solving situations, including the practical use of Algebra. It is also a course that requires a great deal of abstract thinking, visualization in three dimensions, and the use of logic and critical thinking skills.

The goal of Pre-AP Chemistry is to provide students with a foundation to understand the structure and properties of chemical substances and to make predictions in regards to the movement of energy in a system. This course is designed to give you the background and skills to prepare you for more advanced science classes, such as AP Chemistry, AP Environmental Science, and/or AP Biology. By nature, this course is lab-based with special emphasis on quantitative and qualitative methods of analysis. You are expected to be prepared to participate in completing the entrance question each day and participate in all class activities. This is a very easy course to fall behind in quickly if you are not prepared and do not keep up with the pace of the course.

Required Supplies: **2 Composition Notebooks** for Notes and Lab Activities
White board markers and an **Eraser** of different colors for white-boarding activities
Scientific calculator (TI-30, TI-84, or any other TI is sufficient)

Students are expected to be on time to class with their notebooks, whiteboard markers, and scientific calculators. No cell phones are allowed for calculators or other purposes.

Academic Integrity: Integrity of scholarship is essential for an academic community. Flagstaff High School expects that students will honor this principle and in so doing protect the validity of Flagstaff High Schools intellectual work. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind.

Lab Safety: Lab safety is of the utmost importance since many of these labs will be student-directed inquiry based labs involving potentially dangerous chemicals. Close-toed shoes and pants need to be worn on all lab days. If you do not have the proper gear, you cannot participate in the lab. No food or gum in class. Drinks can be consumed only in the lecture area and only in a sealed container. Goggles will always be worn in the lab area, even during the "safe" lab activities.

Grading: 80% Measurement (tests and quizzes), 20% Performance (lab reports and projects). Lab activities will be due three school days following the lab activity.

Scoring: I use a weighted scoring system, where exams or assignments that cover more material are weighted higher. Thus, possible point values for assignments may differ, but if each are weighted at a level of 1, they count equally in the grade book. Example: a journal quiz may be weighed 1, while a unit exam may be given a weight of 4. Thus, the unit exam is worth 4x as much as a journal quiz in the gradebook.

Lecture Notes and Assignments will be posted on my FHS staff webpage. If you were absent or lost anything, you can go to the website and download it. The logistics of set up for labs is difficult. If you know you will be absent, make arrangements to come in either the afternoon before or the morning after to make it up. Assignment due dates and upcoming assignments will be posted on Student/Parent Vue well in advance so you can keep track of what's coming up.

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Topics for Pre-AP Chemistry

Weeks	Unit	Topic(s)	Lab Activities
1.5 wks	1	**Introduction to Chemistry** • Metric System and Units of Measurement • Density (mass/volume) • How to make measurements • Dimensional Analysis/Sig Figs	**Lab:** Determining the concentration of an unknown mixture **Lab:** Determination of metal content of currency
1.0 wks	2	**Atomic Theory** • Atomic Structure (protons, neutrons, electrons) • Atomic Numbers and Defining Elements • Isotopes and Atomic Mass • Introduction to the Mole • Measuring Molecular Mass	**Activity:** Getting to know the elements of the periodic table
1.5 wks	3	**Nuclear Chemistry** • Fission & Fusion • Stars and Supernovae • Transmutations • Radioactivity (α, β^-, β^+, γ) • Half-lives & Radioactive Decay • Carbon-14 and Radiometric Dating Techniques	**Activity:** Measuring radioactivity using a Geiger Counter
2.5 wks	4	**Electron Structure** • Electron Orbitals • Electron Configuration • Aufbau Principal, Hund's Rule, • Electron spin and Pauli Exclusion Principal • Energy Levels (s, p, d, and f orbitals) • Valence Elections • Lewis Dot Structures • Octet Rule • Spectral Analysis	**Lab:** Spectral Analysis of Elements
1.5 wks	5	**The Periodic Table** • Periodic Relationships, Groups/Families • Atomic Radii/Ionic Radii • Electron Affinity • Ionization Energy	**Project:** Families of the Periodic Table **Lab:** Relative Reactivity of Group 2 Elements
2.0 wks	6	**Chemical Bonding** • Electronegativity • Ionic Bonds • Effects of Periodic Trends on Reactivity	**Activity:** Comparing bonds of ionic, covalent, and metallic substances

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		• Metallic Bonds and Metallic Character • Covalent Bonds • Hybridization (sp, sp^2, sp^3) • Resonance and Formal Charge • Hypervalency	**Movie:** Hunting the Elements
1.0 wks	7	**Naming and Writing Compounds** • Ionic Compounds and Polyatomic Ions • Covalent Compounds • Acids and Bases • Naming Organic Compounds	**Activity:** Naming and writing compounds game
1.0 wks	9	**Molecular Geometry** • Drawing Molecules and Lewis structures • VSEPR • Geometry of Polyatomic Ions	**Activity:** Molecular geometry with physical and virtual models
2.5 wks	8	**Intermolecular Forces** • Electronegativity • Polarity and Asymmetry • Dipole-dipole and Ion-dipole Interactions • Hydrogen Bonding • Dipole-induced Dipole • London Dispersion Forces • Phase Changes • Surface Tension and Capillary Action • Colligative Properties (Viscosity, freezing point depression, and boiling point elevation)	**Demo:** Miscibility of iodine in mineral oil, ethanol, and water **Demonstrations:** Surface tension and capillary action **Lab:** Freezing point depression/boiling point elevation
2.0 wks		**Solubility and Solutions** • Factors Affecting Solubility of Ions • Solubility Curves • Gas Solubility • Solubility Rules • Precipitation Reactions	**Lab:** Determining the Solubility Rules **Lab:** Solubility of KNO_3
2.0 wks	10	**Types of Chemical Reactions** • Synthesis Reactions • Decomposition Reactions • Single Replacement Reactions • The Reactivity Series and Electronegativity • Double Replacement Reaction • Combustion Reactions	**Demonstrations:** Each type of chemical reaction **Lab:** Determining the Reactivity Series
18 wks		**End of 1st Semester**	**End of 1st Semester**

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Topics for 2nd Semester

Weeks	Unit	Topic(s)	Lab Activities
1.0 wks	11	**Oxidation-Reduction & Transition Metal Chemistry** • Oxidation Numbers • Redox Reactions • Half-reactions and Balancing Electrons • Transition Metal Chemistry • Intro to Electrochemistry	Demos of Redox Reactions
4.0 wks	12	**Stoichiometry** • Law of Conservation of Mass • Balancing Equations • The Mole and Avogadro's Number • Chemical Reactivity and Products • Percent Composition • Empirical Formulas • Hydrate Crystals • Limiting Reagents and Excess • Percent Yield and Percent Error	**Lab:** Determining the water content of metallic hydrate crystals **Lab:** Determining the Limiting Reagents and Percent Yield **Lab:** Percent Yield Silver Crystals
2.0 wks	13	**Solution Chemistry** • % Solution by Mass • Parts per Million (ppm) • Molarity • Solution Stoichiometry	**Lab:** Calculating the Molarity of an Unknown Solution
2.5 wks	14	**Gas Laws** • Kinetic Theory • Pressure/Temperature/Volume measurements • Boyles' law, Charles' law, Gay-Lussac's law • Combined Gas Law • Ideal Gas Law • Dalton's Law of Partial Pressures • Gas Density and Buoyancy • Molar Mass of Gases • Gas Stoichiometry	Demonstrations: Gas Laws **Lab:** Determining the Molar Mass of Butane
3.5 wks	15	**Enthalpy and Entropy** • Specific Heat Capacity • Heats of Fusion and Vaporization • Heats of Hydration, Solvation, and Dilution • Enthalpy and Calorimetry • Endothermic/Exothermic reactions • Bond Enthalpy	**Lab:** Calorimetry (specific heat, heats of fusion, heats of hydration and dilution) **Demo:** Endothermic Reactions

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		• Heats of Formation • Equilibrium and Reversible Reactions • Hess's Law • Entropy • Introduction to Kinetics and Collision Theory • Reaction Spontaneity and Gibbs Free Energy	**Lab:** Calculating enthalpy of burning paraffin
2.0 wks	16	**Acids and Bases** • Arrhenius Acids/bases • pH Scale • Strong Acids & Bases (complete disassociation) • Weak Acids & Bases (partial disassociation) • Brønsted-Lowry Acid/bases • Acidic and Basic Salts • Acid/Base Titration	**Lab:** Determining pH of Acids and Bases **Lab:** Acid/Base Titration **Demo:** Electrolysis of Water
18 wks		**End of Second Semester**	**End of 2nd Semester**
~ 1 wk	17	*If Time:* **Introduction Organic Chemistry**	