

 **Science Standards**

**AP Chemistry**

**Course Overview:** This course is designed to prepare students for the AP Chemistry test. It is equivalent in scope, difficulty, and speed to an introductory college chemistry course.

**Bold standards are essential standards that all students will learn as they complete the course.**

**Unit 1: Atoms, Molecules, and Stoichiometry (Ch 1,2,3)**

**Description:** This unit will review important concepts from Chemistry 1.

**Standards**

1. Students can estimate the value for mathematical operations if required.
2. Students understand scientific notation and the log scale.
3. Students can use Sig Figs with the four basic mathematical operations.
4. Students can read instrumentation to the correct number of Sig Figs.
5. Students can tell mixtures from pure substances.
6. Students understand the basic experiments done to discover the structure of atoms.
7. Students can identify the subatomic particles.
8. Students can name chemical compounds.
9. Students can complete stoichiometry calculations.
10. Students understand the mole.
11. Students understand the difference between molecular and empirical formulas.
12. **Students can balance chemical reactions.**

**Standards** PS1-7

**Unit 2: Reaction Types, Gases, Periodicity (Ch 4,5,7)**

**Description:** This unit will discuss how chemical reactions and elements can be grouped together to make predictions.

**Standards**

1. Students can classify types of reactions.
2. Students understand the difference between solvents and solutes.
3. Students understand why water dissolves polar substances.
4. Students understand the three models for acidity.
5. Students can calculate molarity.
6. Students can identify types of chemical reactions.
7. Students can use the ideal gas law and other laws to solve problems.
8. Students can identify patterns on the periodic table.
9. Students can apply Beer’s Law to determine concentrations.

**Standards** PS1-1

**Unit 3: Thermodynamics (Ch 6)**

**Description:** This unit studies energy transfers in chemical reactions.

**Standards**

1. Students can explain the meaning of Delta G and Delta H in the context of a reaction.
2. Students understand that chemical bonds store energy which can be released when they are broken.
3. Students understand the difference between endothermic and exothermic reactions.
4. Students understand Hess’s Law.

**Unit 4: Bonding and Orbitals (Ch 8,9)**

**Description:** This unit discusses how electrons overlap to form chemical bonds.

**Standards**

1. Students can diagram s,p, and d orbitals.
2. Students understand how to position nodes and antinodes
3. Students can diagram overlapping orbitals in chemical bonds.
4. Students understand how electronegativity affects the shape of bonds.
5. Students understand how to calculate bond energies and lattice energies.
6. Students understand where octet exceptions come from.
7. Students understand how to read a PES spectrum.

**Standards** PS1-2 PS1-3

**Unit 5: IMFs, Solutions and Kinetics (Ch 10,11,12)**

**Description:** This unit relates intermolecular forces to how well chemicals dissolve in water and other solvents, along with examining how intermolecular forces affect chemical reactions.

**Standards**

1. **Students can identify the intermolecular forces a set of molecules would experience.**
2. Students can rank IMFs by strength.
3. Students can identify metallic and network solid bonding.
4. Students can relate IMFs to phase changes and vapor pressure.
5. Students can read phase diagrams.
6. Students understand how colligative effects relate to concentration.
7. Students can calculate the rate and relate it to kinetics.
8. Students can use the integrated rate laws.
9. Students can identify the reaction mechanism from a rate law.

**Standards** PS1-5 PS1-6

**Unit 6: Equilibrium (Ch 13)**

**Description:** This unit will review the equilibrium unit from Chemistry 1.

**Standards**

1. Students can use equilibrium constants and equations.
2. **Students can apply Le Chatlier’s principle.**
3. Students can use pressures in equilibrium expressions.

**Unit 7: Acids/Bases Equilibrium (Ch 14,15)**

**Description:** This unit will apply equilibrium to acid/base reactions, weak acids and weak bases.

**Standards**

1. Students can identify acids and bases
2. Students can make pH calculations.
3. Students can calculate pHs for strong and weak acids.
4. Students can use the Henderson Hasselbac equation.
5. Students can determine conjugate bases for acids.
6. Students can determine the acidity/basicity of salts.
7. Students can calculate the pH of buffers.
8. Students can select the proper indicator for acids and bases.

**Unit 8: Spontaneity, Entropy, Delta G, Delta S (Ch 17)**

**Description:** This unit will discuss what causes reactions to run in the direction they do, and why some reactions go in reverse.

**Standards**

1. **Students can define and use the concept of spontaneous reactions.**
2. Students can relate entropy to thermodynamic laws.
3. Students can calculate free energy.
4. Students can calculate how entropy changes with temperature changes.
5. Students can relate entropy and free energy to work.

**Standards** PS1-4

**Unit 9: Electrochemistry (Ch 18)**

**Description:** This unit will discuss chemical reactions that transfer electrons between elements.

**Standards**

1. Students can balance redox reactions.
2. Students can calculate cell potential and work.
3. Students can do stoichiometry related to electrochemistry.
4. Students can correct for correction using the Nernst equation.