

**Science Standards**

**Chemistry 1**

**Course Overview:** This course is designed to teach students chemistry and potentially prepare students for AP Chemistry. Additionally, it is recommended for college-bound students to prepare them for the rigors of college science classes.

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

**Unit 1: Structure of the Atom**

**Description:** This unit will study the structure of atoms and how they can vary between ions, isotopes, and atoms.

**Standards**

1. Students can explain the three experiments that helped discover the modern structure of the atom.
2. Students can identify the three major subatomic particles.
3. Students can draw the orbital model of the atom look like.
4. Students can use the average atomic mass formula to calculate atomic masses.
5. Students can explain where atomic spectrums come from.
6. Students can calculate energy levels, radii, and wavelength using the equations.
7. Students can write the electron configuration for both elements and ions.
8. Students can explain why some ions more likely to form than others.
9. Students can identify atomic orbitals from drawings or descriptions.

**Standards** PS1-1

**Unit 2: Molecular Geometry and Lewis Dot Structures**

**Description:** This unit will study how molecules bond to each other, and how those bonds can affect the reactions a molecule can perform.

**Standards**

1. Students can draw Lewis Dot Structures for molecules.
2. Students can identify resonance and isomeric LDSes.
3. Students can determine the 3-D geometry of a molecule from an LDS.
4. Students can identify the more electronegative atom.
5. Students can identify which atom (or which ion of the same atom) will be larger or smaller.
6. Students can identify if a molecule contains Ionic, Metallic, or Covalent bonds.
7. Students can explain the differences in electron behavior between Ionic, Metallic, and Covalent bonds.
8. **Students can identify if a molecule is polar or not.**
9. Students can identify which of the three major types of intermolecular forces a molecule will experience.
10. Students can interpret the results of a chromatography experiment.

**Standards** PS1-1, PS1-2, PS1-3

**Unit 3: Naming and Stoichiometry**

**Description:** This unit will discuss how chemical compounds can be named, and how students can mathematically determine the number of reactants or products will be made by a reaction.

**Standards**

1. Students can name ionic, covalent, and metallic compounds.
2. Students can balance Chemical Reactions
3. Students can determine which of the 6 types of reactions a chemical reaction is.
4. **Students can use Stoichiometry to convert between grams, moles, number of molecules and the number of atoms**.
5. Students can use Stoichiometry to convert between amounts of reactants to products.
6. Students can use Stoichiometry to complete limiting reactant problems.
7. Students can use Stoichiometry to find the ratio between elements in a chemical compound.

**Standards** PS1-7

**Unit 4: Gasses and Gas Laws**

**Description:** This unit will discuss the behavior of ideal gasses.

**Standards**

1. Students can use the Ideal Gas Laws to solve problems.
2. Students can combine Stoichiometry and the Gas Laws to answer questions.
3. Students can use the KMT to redraw distributions of gas particles at various temperatures.
4. Students can relate the KMT to the Ideal Gas Laws
5. Students can use Dalton’s Law and Avogadro's Law in other problems.

**Standards** PS1-5

**Unit 5: Acids and Bases**

**Description:** This unit will explore the behavior of acids, bases, and how the concentration of acids and bases can be determined using titrations.

**Standards**

1. Students can convert between [H+], pH, pOH, and [OH-]
2. Students can calculate the molarity of a solution using a known amount of solid and water.
3. Students can use the titration equation and the dilution equation.
4. Students can explain the difference between strong and weak acids and bases.
5. Students can draw a titration curve for both strong and weak acids and bases.
6. Students can analyze sources of error in a titration.
7. Students can identify if an acid or base is weak or strong, from the formula or other given data.
8. Students can draw particle drawings for different parts of a titration.

**Unit 6: Solubility**

**Description:** This unit describes how chemicals dissolve in water and how this process can be mathematically described.

**Standards**

1. Students can write Ksp expressions
2. Students can use ICEE tables to solve for concentrations of chemicals in saturated solutions
3. Students can apply Le Chatelier’s principal to problems.
4. Students can experimentally calculate the solubility of an unknown solid.

**Standards** PS1-6

**Unit 7: Weak Acids and Bases**

**Description:** This unit applies the concepts of equilibrium to weak acids and bases.

**Standards**

1. Students can write Ka and Kb expressions for weak acids and bases.
2. Students can solve for the starting pHs of weak acids and bases.
3. Students can solve for the endpoint pH for weak acids and bases.
4. Students can solve for the pH at intermediate points for acids and bases in a titration.
5. Students can draw a titration curve for titrating weak acids and bases.
6. **Students can apply Le Chatelier to weak acid/base reactions.**
7. Students can identify the appropriate buffer for a specific pH .
8. Students can explain how buffers stabilize the pH of a solution.

**Standards** PS1-6

**Unit 8: Redox Reactions**

**Description:** This reaction discusses redox reactions, where electrons are transferred between atoms, including the special balancing procedure required for the reactions

**Standards**

1. Students can calculate the oxidation number for any chemical in a chemical formula.
2. Students can identify if a half reaction is reduction or oxidation.
3. Students can identify if a cell is voltaic or electrolytic.
4. Students can balance a redox reaction in acid or base
5. Calculate Ecell for standard conditions and non-standard conditions.

**Unit 9: Rate**

**Description:** This unit discusses methods to determine how fast a chemical reaction runs.

**Standards**

1. Students can use the data table method or the graphical method to determine the order and K value for a chemical reaction
2. Students can use a reaction mechanism to determine the order of a reaction.
3. Students can identify the catalysts and intermediaries of a reaction using elementary steps.
4. Students can use the integrated rate laws to solve for chemical concentrations.
5. Students can interpret a potential energy graph.
6. Students can identify the activation energy and ΔE on a potential energy graph.

**Standards** PS1-4

**Unit 10: Organic**

**Description:** This unit provides and introduction to organic chemistry, the chemistry of carbon.

**Standards**

1. Students can describe what makes organic chemistry unique.
2. Students can name linear alkanes.
3. Students can identify common functional groups.
4. Students can name branched alkanes.
5. Students can name molecules containing a single functional group.
6. Students can predict the product of a Fisher Esterification.