Chemistry, Part 1
Course Outline & Objectives

Course Description:

This chemistry course will introduce students to and will master basic chemistry principles, such as the characteristics of matter, how that matter is organized on the periodic table, and, based on these patterns, which elements react with one another and how. With an emphasis on the conservation of matter, students will learn the different types of reactions, chemical proportions in compounds, and the calculation of quantities in chemical reactions. The student will better understand the above concepts through direct experimentation with the laboratory activities provided in the course. Laboratory investigations incorporate procedures and develop students' ability to synthesize and analyze information. Students will continue developing their reading, writing, and critical thinking skills through culminating assignments. These assignments ask students to analyze chemistry in everyday life. Technology is utilized throughout the course through virtual activities, videos, and readings about each area of study.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits)

Course Outline

Unit 1: Observing Matter

1.1 Great Discoveries in Chemistry.
1.2 Scientific Method and CRAAP
1.3 Scientific Method
1.4 Physical and Chemical Properties
1.5 Classifying Matter
1.6 Paper Chromatography

Next Generation Science Standards

Unit 1 introduces students to the study of Chemistry. This unit gives students a brief overview of what Chemistry is all about and its importance and the integration with scientific inquiry. Students learn about critical historical discoveries in Chemistry and the people who made these discoveries possible, as well as current scientific discoveries. This unit begins with the application of the scientific method and teaches students how to research scientific information properly. Students receive an introduction to physical and chemical properties, what they are, their classifications, and how to classify them.

[HS-PS1-1] [HS-LS2-7] [HS-PS1-5] [HS-ESS2-4]
[HS-PS1-3] [HS-LS2-4] [HS-ESS3-3] [HS-ESS2-4] [HS-PS4-3]
[HS-PS1-2] [HS-PS1-4] [HS-PS1-5] [HS-PS1-6] [HS-PS1-4]

Course Outline

Unit 2: Elements and the Periodic Table

2.1 Model of the Atom
2.2 Valence Electrons and the Electron Filling Rule
2.3 Atomic Orbital Models
2.4 Periodic Law and Trends in the Periodic Table
2.5 Forms of Elements
2.6 Hybridization
2.7 Hybridization of Orbitals

Next Generation Science Standards

Unit 2 introduces students to the elements and their places on the Periodic Table. Students learn about the atom, what it is, its structure, and the various atomic models from the past to the present. Continuing their studies of elements and the Periodic Table, students learn about valence electrons, the Periodic Law, and the trends in the periodic table of elements. Students learn about atomic orbitals and hybridization. The students will also explore the different forms of elements (from articles from the National Institute of Health and the CDC) and their characteristics, learning that an element's unique properties can be beneficial or harmful depending on the electron configuration. Overall, this unit helps students develop a deeper understanding of the structure of atoms and how it relates to the properties and behavior of matter, as well as how students can apply this knowledge to make predictions and explanations about chemical reactions. Specifically, it focuses on the role of electrons in determining the behavior of atoms and provides strategies for drawing diagrams and assigning electrons to orbitals. By understanding these concepts, students can better understand the periodic table and use it to predict the behavior of different elements.

[HS-PS1-1] [HS-PS1-2] [HS-PS1-3] [HS-PS1-7] [HS-PS2-6] [HS-PS1-4] [HS-PS1-6]

Unit 3: Chemical Compounds and Bonding.

3.1 Types of Bonds: Ionic and Covalent
3.2 Properties of Ionic and Covalent Compounds - Conductivity
3.3 Writing Chemical Formulas for Ionic and Polyatomic Ions
3.4Writing Chemical Formulas for Molecular Compounds
3.5 Writing and Balancing Chemical Equations
3.6 Synthesis and Decomposition Reactions
3.7 Decomposition and the Electrolysis of Water

Unit 3 introduces students to chemical compounds and bonding. Students learn what chemical compounds are, how they are formed, and their makeup. This includes looking at ionic and covalent compounds and various chemical bonds. Students learn the principles behind writing chemical formulas and recognize the role of ions in compounds, with lots of practice writing formulas and balancing equations, which allows them to use their analytical and critical thinking skills. Students begin to explore the simplest chemical reactions of synthesis and decomposition and investigate the electrolysis of water, which involves both chemical and physical changes.

[HS-PS1-2] [HS-PS1-1] [HS-PS1-3] [HS-PS1-4] [HS-PS1-5] [HS-PS1-7] [HS-PS2-6] [HS-PS3-5]

Course Outline

Unit 4: Chemical Reactions

4.1 Combustion Reactions
4.2 Single Displacement Reactions
4.3 Oxidation-Reduction Reactions
4.4 Double Displacement Reactions
4.5 Double Displacement Precipitations and Solubility Rules
4.6 Acid- Base Neutralization Reaction

Next Generation Science Standards

Unit 4 introduces students to chemical reactions. Students learn about different types of chemical reactions, include synthesis, decomposition, combustion, oxidation-reduction, single and double displacement reactions, and acid-base neutralization. Using skills and knowledge from prior lessons, these modules allow students to continue to use their analytical and critical thinking skills while building their chemistry knowledge base.

[HS-PS1-2] [HS-PS1-7] [HS-PS1-5] [HS-PS1-6] [HS-ETS1-3] [HS-ETS1-4]

Unit 5: Conservation of Matter

5.1 Avogadro's Number and the Mole
5.2 Formula Mass
5.3 Analysis of Hydrates
5.4 Isotopes and Average Atomic Mass
5.5 Converting Between Mass, Moles and Number of Particles
5.6 Mole Ratio

Unit 5 is about the conservation of matter. Students learn about isotopes, what they are and their place in the study of chemistry. Students learn about atomic mass and what atomic mass is. Students also learn and practice calculating the atomic mass. Students are introduced to Avogadro's number, the Mole, and learn what it is and how it is used in chemical equations. This unit also introduces students to formulas and allows them to use their analytical and critical thinking skills in calculations, formula balances, stoichiometry and mole ratios. Finally, this unit instructs students on converting between mass, mole, and the number of particles.

[HS-PS1-1] [HS-PS1-7] [HS-PS1-3] [HS-PS1-5] [HS-PS1-6] [HS-ETS1-3] [HS-ETS1-4] [HS-PS1-2] [HS-PS1-4] [HS-PS1-8] [SEP]

Unit 6: Chemical Proportions in Compounds

6.1 Percentage Composition
6.2 Titration
6.3 Titration
6.4 Empirical Formula
6.5 Determining Empirical Formula by Experiment
6.6 Molecular Formula
6.7 Determining Molar Mass by Titration
6.8 Determining Molar Mass by Titration

Unit 6 is the study of chemical proportions in compounds. Students learn about chemical composition and how to calculate the percentage of a composition. Students are introduced to the empirical formula and learn its importance in the study of chemistry. Students learn how to determine and calculate empirical formulas based on prior lessons. Along with the empirical formula, students learn about the molecular formula. Students will learn how titration is used to determine the composition and molecular mass of substances. Students will learn how to determine and calculate molecular structure and chemical equations.

[HS-PS1-7] [HS-PS1-2] [HS-PS1-5] [HS-PS1-3] [HS-PS1-1] [HS-PS2-6] [SEP] [CCC] [PS1.B] [PS1.A] [HS-ETS1-3] [ETS1.A] [HS-PS1-4]