Physical Science, Part 1
Course Outline & Objectives

Course Description:

In Physical Science Part 1, students will explore the properties and classification of matter, including the differences between pure substances and mixtures, and physical and chemical properties like boiling point, reactivity, and density. They will examine atomic structure and use the periodic table to predict element behavior based on trends such as valence electrons and reactivity. Students will investigate chemical bonding–ionic, covalent, and metallic – and apply nomenclature rules to write and name compounds. They will analyze chemical reactions by identifying types, balancing equations, and applying Le Chatelier's Principle to understand equilibrium. The course connects chemistry to real life through topics like water contamination, carbon-based life, GMOs, CRISPR, and plastics. It ends with a study of chemical energy, nuclear reactions, and applications such as carbon dating and radioactive decay.

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

Course Outline

Unit 1: Matter

1.1 Our World
1.2 Scientific Method and CER
1.3 What is Matter?
1.4 Physical and Chemical Properties
1.5 Classifying Matter
1.6 States of Matter

Unit 2: Trends of the Periodic Table

2.1 Periodic Table
2.2 Using Models to Represent Valence Electrons and Ions
2.3 Trends of Metals
2.4 Trends of Nonmetals
2.5 Predicting Reactivity
2.6 Solving PEN Problems

Unit 3: Bonding

3.1 Types of Bonding
3.2 Ionic Bonds
3.3 Covalent Bonds
3.4 Metallic Bonds
3.5 Nomenclature

Next Generation Science Standards

In Unit 1 students will:
Classify matter as a mixture or pure substance.
Be able to determine if a change is physical or chemical.
Distinguish between a physical and chemical property when describing matter.
Make observations in order to determine the properties of matter.
Classify matter as solid, liquid, or gas.
Solve gas law equations for a missing variable.
[HS-PS1-1, HS-PS1-3, HS-PS2-6]

In Unit 2 students will:
Identify elements based on atomic number.
Calculate the number of electrons, protons, and neutrons to identify an element as an atom, ion or isotope.
Explain the difference between atomic mass and mass number.
Determine if an element is a metal, non-Metal or metalloid based on location in the periodic table.
Identify reactivity and atomic size based on location in the periodic table.
Explain how valence electrons impact the reactivity.
[HS-PS1-1, HS-PS1-2, HS-PS2-6]

In Unit 3 students will:
Classify bonds as ionic, covalent, or metallic.
Identify types of covalent bonds (single, double and triple).
Explain the advantages of polar covalent bonds.
Compare the properties of ionic, covalent, or metallic compounds.
Write formulas of ionic, covalent, or metallic compounds.
Write names of ionic, covalent, or metallic compounds.
[HS-PS1-1, HS-PS1-3, HS-PS2-6]

Course Outline

Unit 4: Chemical Reactions

4.1 Types of Reactions
4.2 Balancing Equations
4.3 Equilibrium
4.4 Le Chatelier's Principle
4.5 Rates of Reaction

Next Generation Science Standards

In Unit 4 students will:

Explain the factors that make elements react.
Classify chemical reactions.
Write chemical equations.
Count elements based on coefficients, subscripts and parentheses used.
Use the Law of Conservation of Mass to balance chemical equations.
Identify the factors that impact equilibrium.
Use Le Chatelier's Principle to describe how changes impact equilibrium.
Describe the factors that impact the rate of reaction
[HS-PS1-2, HS-PS1-4, HS-PS1-5, HS-PS1-6, HS-PS1-7]

Unit 5: Chemistry of Life

5.1 Water
5.2 Carbon
5.3 Organic Chemistry
5.4 Biochemistry
5.5 Polymer Chemistry

In Unit 5 students will:

Identify the properties of water that make it a universal solvent.
Identify how these properties make it easy to contaminate water.
Explain why carbon is the "element of life".
Explain whether non-carbon based life forms are possible.
Describe how a GMO is made.
Explain how CRSPR technology can cure genetic diseases.
List the pros and cons of plastics
[HS-PS1-2, HS-PS1-4, HS-PS1-8, HS-PS2-6]

Unit 6: Chemical Energy

6.1 Exothermic vs Endothermic
6.2 Nuclear Energy
6.3 Fusion vs Fission
6.4 Radioactive Decay

In Unit 6 students will:

Classify chemical reactions as exothermic or endothermic.
Classify nuclear reactions as fission or fusion.
Solve problems related to half life.
Determine the age of an artifact based on carbon dating.
[HS-PS1-8, HS-PS3-3, HS-PS3-4]