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# Chemistry II

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**Prerequisite:** Chemistry I

**Level:** 11th – 12th grade

**Credit:** 1.0 – Science

**Additional:** This course is accepted as a science credit for H.S. graduation.  
This course is accepted as a science credit for college admission.  
This course is accepted as a science credit by the NCAA.

## Course Description

This course provides a broad overview of the principles of chemistry and the reactivity of the chemical elements and their compounds. The text we use shows a close relation between the macroscopic observations we make of chemical and physical changes, the symbols we use to describe those changes, and the way we view those changes at the atomic and molecular levels. This course also gives a much deeper base to the surface knowledge learned in Chemistry I.

## Course Objectives

- Students will demonstrate knowledge in determining the difference between a hypothesis, theory and scientific law.
  - Students will recognize the difference between properties of isotopes of an element.
- Students will know and apply the organization of the periodic table in terms of physical and chemical properties.
  - Students will know and apply certain laws and the equations that correspond with them.
- Students will use stoichiometric principles to analyze substances to determine empirical and molecular formulas.
  - Students will know and apply skills necessary to predict the products of certain chemical reactions.
- Students will demonstrate knowledge of recognizing oxidation-reduction reactions based their oxidation numbers.
  - Students will calculate and perform dilutions from more concentrated solutions.
    - Students will use titration to analyze solutions and standardize solutions.
  - Students will use equations to calculate heat and energy transfer in a system.
    - Students will recognize state functions of a system.
- Students will demonstrate knowledge of the laws of thermodynamics by performing calculations.
  - Students will apply Hess's law to find the enthalpy change for a reaction.
- Students will determine electron configurations and chemical periodicity of atoms and molecules.
- Students will apply principles of reactivity for acids and bases, precipitation reactions, and entropy and free energy.
  - Students will demonstrate basic knowledge of nuclear chemistry.
  - Students will demonstrate basic knowledge of organic chemistry.

## Course Outline

### Matter and Measurement

- Classifying matter – elements, atoms, compounds and molecules
  - Physical and Chemical Properties
  - Physical and Chemical Changes
    - Units of Measurement
    - Problem Solving

### Atoms and Elements

- Protons, Neutrons, and Electrons
- Atomic Structure- Atomic Mass and Atomic Number
  - Isotopes
  - Atomic Weight
  - The Periodic Table

## Molecules and Compounds

- Ionic and Molecular compounds
- Naming Ionic and Molecular compounds
  - The Mole
- Chemical Equations and Stoichiometry
  - Balancing Chemical Equations
- Mass Relationships in Stoichiometry
  - Limiting Reactant
  - Percent Yield
- >Reactions in Aqueous Solution
- Properties of Compounds in Aqueous Solution
  - Precipitation Reactions
  - Acids and Bases Reactions
  - Gas-Forming Reactions
  - Oxidation –Reduction Reactions
- Measuring Concentrations of Compounds in Solution
- Principles of Reactivity: Energy and Chemical Reactions
  - Types of Chemical Reactions and Thermodynamics
    - Energy
- Specific Heat Capacity and Thermal Energy Transfer
  - Energy and Changes of State
    - Enthalpy
    - Hess's Law
    - State Functions
  - Standard Enthalpies of Formation
- Atomic Structure
  - Shape of Atomic Orbitals
  - Wave Properties of Electrons
  - Electromagnetic Radiation

## Atomic Electron Configurations and Chemical Periodicity

- Electron Spin
- Atomic Electron Configuration
- Electron Configurations of Ions

## Nuclear Chemistry

- The Nature of Radioactivity
  - Nuclear Reactions
- Rates of Disintegration
  - Nuclear Fission
  - Nuclear Fusion

## Organic Chemistry

- The Uniqueness of Carbon
  - Hydrocarbons
  - Alkenes and Alkynes
  - Alcohols and Amines

## Teaching Methods

This course is taught through lecture, discussion, and laboratory, videos, demonstration and computer software. The students have individual daily assignments and some group assignments.

We do a unit on analytical chemistry during the last quarter. During this unit the students are responsible for performing a wide spectrum of tests on solutions to separate and analyze the contents. After they have determined how to separate the solutions according to specific tests, they are then given an unknown solution to analyze for its contents. This project takes approximately 5 weeks and is evaluated on a daily basis.

## Assessment

- Daily assignments will be graded for points. Each chapter will have approximately the same number of daily points as the test for that chapter is worth.
- There will be a lab for almost every chapter we complete. Some chapters we will have more than one lab depending on the subject matter being studied. The labs will be graded according to lab technique demonstrated as well as the correct procedures followed.
- For each group project, the students will be assessed individually and as a group. Each student is expected to demonstrate proper cooperative learning skills that enable their group to succeed.

- There will be a chemist of the month for every month of the school year that the students can utilize for extra credit points. The chemists assigned have all been recognized for their contributions to the field of chemistry.

### **Text**

Chemistry and Chemical Reactivity, Fourth Edition, Kotz and Treichel, 1999

### **Enrichment**

- Worksheets from An Easy Approach to Solve Chemistry Problems written by Frank Pichardo in 1998.
  - Videos-The World of Chemistry, The Annenberg/CPB Collection
- Demonstrations taken from Chemical Demonstrations, written by Bassam Z. Shkhashiri.

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