

Science Department Guide Chemistry (College Prep) Overview

Course Description: Chemistry (College Prep)

This course provides a basic background in chemical concepts through discussion and laboratory experiences. Topics covered in the course include techniques of observation and description, periodicity of elements, atomic theory and structure, bonding, the mole concept, chemical equations, acids and bases and the solution process. Effort is made to help the student relate chemical knowledge to the problems and issues of modern society. Laboratory experiments are performed regularly. Evaluation of the student will be based upon tests, quizzes, laboratory reports and class participation

Prerequisite: Minimum grade of “C” in Biology, Algebra I, and Geometry and students should be enrolled in Algebra II

Major Course Objectives

When students have completed Chemistry (College Prep), they will have an understanding of:

1. Matter and Change
 - a. The scientific method
 - b. Physical and chemical properties
 - c. Basic research, applied research, and technological development
 - d. Calculations using SI units and significant figures

2. Atomic Theory
 - a. The structure of atoms
 - b. Mole problems
 - c. The law of conservation of mass, the law of definite proportions, and the law of multiple proportions
 - d. The Bohr model and the quantum model of the atom
 - e. The four quantum numbers and their significance

3. The periodic table
 - a. Arrangement and trends
 - b. Electron configuration

4. Chemical Bonding
 - a. Ionic and covalent bonding
 - b. Metallic
 - c. Lewis structures
 - d. Geometry and polarity of molecules

5. Chemical formulas and nomenclature
 - a. Oxidation numbers
 - b. Polyatomic ions

6. Writing/balancing a chemical equation

- a. Stoichiometry and % yield
 - b. % composition, empirical, and molecular formulas
7. Properties of gases using kinetic molecular theory
 - a. Gas law problems
 8. Properties of liquids/solids especially water
 - a. Changes in equilibrium using LeChatelier's principle
 - b. Solution equilibrium
 - c. Molarity
 - d. Dissociation, overall, and net ionic equations
 - e. Colligative properties
 9. Properties of acids and bases
 - a. Acid/base nomenclature
 - b. Bronsted-Lowry acid/bases
 - c. Neutralization reactions
 - d. Acid/base neutralization, indicators, and pH
 10. Chemical Equilibrium
 - a. Thermochemistry
 - b. Shifting equilibrium
 - c. Driving force of reactions-Enthalpy/Entropy
 - d. Reaction mechanism and reaction rate
 11. Reaction types
 - a. Precipitation reactions
 - b. Oxidation-Reduction reactions
 - c. Electrochemistry
 13. Nuclear chemistry
 - a. Radioactive decay
 - b. Isotopes
 14. Organic chemistry
 - a. Carbon and hydrocarbons
 - b. Nomenclature
 15. Laboratory
 - a. Making observations of chemical reactions and substances
 - b. Recording data
 - c. Calculating and interpreting results based on the quantitative data obtained
 - d. Communicating effectively the results of experimental work

Relationship to the Massachusetts Science Curriculum Framework

Students engage in problem solving, communicating, reasoning as they

1. Use chemical and physical properties to classify and describe matter
2. Observe the interaction of elements and compounds on a macroscopic scale to understand the atomic model
3. Relate the periodicity of physical and chemical properties to atomic structure and the arrangement of the periodic table

4. Explain how atoms form chemical bonds
5. Balance chemical equations and apply stoichiometry
6. Explain the behavior of gases by the Kinetic Molecular Theory
7. Describe the solution process
8. Apply acid/base theory
9. Identify the factors that affect the rate of a chemical reaction and the factors that can cause a shift in equilibrium
10. Explain the driving forces in a chemical reaction
11. Describe the process of oxidation-reduction

Assessment Tools

Success in Chemistry (College Prep) will be assessed by the following methods:

1. Homework may be checked for completeness, accuracy, and/or understanding.
2. Class work will be evaluated overall by the teacher.
3. Laboratory work/reports will be checked for completeness, accuracy, and/or understanding
4. Formative and summative quizzes are given as needed.
5. Tests are primarily summative, yet various parts may, as needed, be treated as formative.
6. Unit tests may consist of multiple choice, short answer, and/or open response items.
7. Emphasis is put on organization, notation, accuracy and proficiency of student work.
8. The final exam will consist of primarily multiple choice, short answer and open response questions.

Materials and Resources

Davis, Metcalfe, Williams and Castka, Modern Chemistry, Austin, Texas: Holt, Rinehart and Winston, 1999. (This is the primary text for this course. It includes a number of labs used in this course.)

Other labs are derived from a multitude of lab manual resources in the chemistry stockroom.

Journal of Chemical Education

Chem 13 News

Annenberg Chemistry Video Series and other related videos located in the chemistry storeroom.

Relationship to the High School Student Expectations

The members of the Scituate High Science Department will offer to every student the opportunity to:

1. Be an effective reader

2. Be an effective writer
3. Be an effective speaker/presenter/performer
4. Be an effective problem solver
5. Be an effective information seeker/organizer
6. Contribute to the community at large