Science Department Guide
Chemistry II (Honors) Overview

Course Description: Chemistry II (Honors)

This course is designed for high ability students who are considering post-secondary studies in the physical or biological sciences, medicine or engineering. It explores in considerable depth topics introduced in the first year chemistry course: atomic theory and structure, theories of intermolecular and intramolecular bonding, acid base and oxidation reduction concepts and chemical equilibrium. Organic as well as inorganic structures are studied. The nomenclature and mechanistic theory of organic chemistry are introduced. Laboratory experiments, generally quantitative in nature and similar to those done in first and second year college courses, are performed regularly using both traditional methods and computers. Each term, students are required to conduct an experiment to identify the content(s) of an unknown compound. Evaluation of the student is determined by achievement in tests, quizzes, laboratory reports, term papers and special project papers as well as class participation

Prerequisite: Minimum grade of "B-" in Chemistry (H), Algebra II and Trigonometry as well as the recommendation of the chemistry and physics teachers.

Major Course Objectives

When students have completed ChemistryII (Honors), they will know and be able to:

1. The scientific method
2. Physical and chemical properties
3. Basic research, applied research, and technological development
4. Calculations using SI units and significant figures
5. The structure of atoms
6. Mole problems
7. Modern Atomic Theory
8. The law of conservation of mass, the law of definite proportions, and the law of multiple proportions
9. The Bohr model and the quantum model of the atom
10. The four quantum numbers and their significance
11. The periodic table- arrangement and trends
12. Ionic and covalent bonding
13. Lewis structures
14. Shapes and polarity of molecules
15. Chemical formulas and nomenclature
16. Oxidation numbers
17. % composition, empirical, and molecular formulas
18. Stoichiometry and % yield
19. Writing/balancing a chemical equation

20. Properties of gases using kinetic molecular theory
21. Gas law problems
22. Properties of liquids/solids especially water
23. Changes in equilibrium using LeChatelier's principle
24. Solution equilibrium
25. Molarity
26. Dissociation, overall, and net ionic equations
27. Colligative properties
28. Properties of acids and bases
29. Acid/base nomenclature
30. Bronsted-Lowry acid/bases
31. Neutralization reactions
32. Acid/base neutralization, indicators, and pH
33. Thermochemistry
34. Driving force of reactions-Enthalpy/Entropy
35. Reaction mechanism and reaction rate
36. Chemical Equilibrium
37. Oxidation-Reduction reactions
38. Electrochemistry
39. Nuclear chemistry
40. Organic chemistry
41. Carbon and hydrocarbons

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 II (Honors) will be assessed by the following methods:

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

Materials and Resources

Masterton, Slowinski, and Stanitski. Chemical Principles sixth edition, New York: Saunders College Publishing,1985 (This is the primary text for this course)

Slowinski, Wolsley and Masterton,. Chemical Principles In the Laboratory, sixth edition, New York: Saunders College Publishing, 1996 (This is the primary lab manual for this course)

Timberlake,Karen C. Chemistry fifth edition, HarperCollins, 1992

Morrison and Boyd, Organic Chemistry, 3rd edition Allyn and Bacon, Boston, 1976

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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/perfomer
4. Be an effective problem solver
5. Be an effective information seeker/organizer
6. Contribute to the community at large