

High School Course Content Outline

Chemistry I Catalog #: 6311, 6312, 6313

This course emphasizes the recognition of scientific methods, the use of the periodic table as an important tool of the study of chemistry, the use of mathematics as the language and tool of science, and the development of skills, techniques, and attitudes related to laboratory procedures and activities. The content of the beginning chemistry course include laboratory safety, atomic structure, atomic bonding, inorganic nomenclature, equations, stoichiometry, solutions, gas laws, and oxidation reduction. Organic chemistry may be included.

All Chapter and section references refer to **Holt Modern Chemistry** copyright edition 2006.

1st Quarter (3 Units)

Content Standard:

Structure and Properties of Matter

Introduction to the Study of Chemistry 3.5 weeks (Modern Chem. Ch. 1, 2)

Content Benchmark: 1.3 An element is composed of a single type of atom. When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties.

Process standards focus:

- PS 1: Observe and Measure
- PS 3: Experiment
- Emphasis on laboratory safety

Modern Chemistry

Chapter 1.1

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Chapter 1.2

1.2

1.2

1.2

1.2

1.2

Chapter 2

2.1

2.1

2.2

2.2

2.2

2.3

2.3

1. Chemistry is the study of matter
2. Safety in the chemistry classroom and lab
 - a. Introduction to basic lab skills and equipment
 - b. Matter is classified according to its composition and state
 - c. Mixtures – heterogeneous and homogeneous
 - d. Pure substances – compounds and elements
 - e. States of matter – solids, liquids, gases
3. Matter has chemical and physical properties
4. Matter undergoes chemical and physical changes
5. Science Skills used to study chemistry
 - a. Scientific Method
 - b. Making & interpreting observations
 - c. Reporting observations
6. Measurement of matter
 - a. Use of the SI unit measurements in basic calculations
 - b. Dimensional analysis for unit conversions
 - c. Use of Significant Figures in measurements and calculations
 - d. Use of scientific notation

and the Periodic Table 4 weeks (Modern Chem. Ch. 3, 4, 5)

Content Benchmarks:

1.1 Matter is made of atoms and atoms are composed of even smaller components - protons, neutrons, and electrons.

1.2 Atoms interact with one another by transferring or sharing outer electrons that are farthest from the nucleus. These outer electrons govern the chemical properties of the element.

1.3 An element is composed of a single type of atom. When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties.

Chapter 3&4

3.1

3.2

3.2

4.1

3.3

3.3

4.3

Chapter 5

5.1

5.2

5.3

5.2

1. Structure of the atom
 - a. Development of the Atomic Theory
 - b. Atomic components – protons, neutrons, electrons
 1. Rutherford’s model
 2. Bohr’s model
 - c. Isotopes
 - d. Counting atoms – moles and molar mass
2. Electron configurations
3. The Periodic table
 - a. Development of the periodic table
 - b. Organization scheme of the periodic table
 - c. Periodic Trends
4. Elements and their symbols

Chemical Bonding

2 weeks

(Modern Chem. Ch. 6)

Content Benchmarks:

1.2 Atoms interact with one another by transferring or sharing outer electrons that are farthest from the nucleus. These outer electrons govern the chemical properties of the element.

1.4 A compound is formed when two or more kinds of atoms bind together chemically. Each compound has unique chemical and physical properties.

Chapter 6.1

6.1

6.1

6.2

6.2

6.3

6.4

6.5

1. Introduction to chemical bonding
 - a. Electronegativity
 - b. Bond polarity
2. Covalent Bonding
 - a. Lewis structures
3. Ionic bonds
4. Metallic bonding
5. Intermolecular forces
 - a. Hydrogen bonding

2nd Quarter (3 units)

Content Standards: Chemical Reactions

A chemical reaction is a reaction in which one or more substances are converted into different substances. A chemical change cannot be reversed by physical means.

Chemical Nomenclature 3 weeks (Modern Chem. Ch. 7)

Content Benchmark: 1.4 A compound is formed when two or more kinds of atoms bind together chemically. Each compound has unique chemical and physical properties.

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|-------------|--|
| Chapter 7.1 | 1. Naming ionic compounds – metal and nonmetal |
| 7.1 | a. Polyatomic ions |
| 7.1 | 2. Naming binary molecular compounds |
| 7.1 | 3. Naming inorganic acids |
| 7.1 | 4. Writing formulas from names |
| 7.2 | 5. Oxidation numbers |
| 7.2 | 6. Percent composition |
| 7.3 | 7. Empirical and molecular formulas |

Unit 5: Chemical Reactions and their calculations 5 weeks (Modern Chem. Ch. 8 and 9)

Content Benchmarks:

2.3 Chemical substances react in definite molar weight proportions.

2.4 Mass is conserved in chemical reactions (balancing of equations).

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|-------------|---|
| Chapter 8.1 | 1. Evidence of a chemical reaction |
| 8.1 | 2. Expressing chemical reactions in equations |
| 8.1 | 3. Balancing chemical equations |
| 8.2 | 4. Types of chemical reactions |
| 8.2 | 5. Predicting if a reaction will occur |
| 8.3 | a. Activity series |
| Chapter 9 | 6. Stoichiometry |
| 9.1 | a. Mole – mole calculations |
| 9.2 | b. Mole – mass calculations |
| 9.2 | c. mass – mass calculations |
| 9.3 | 7. Limiting reactants |
| 9.3 | 8. Percent Yield calculations |

3rd Quarter (2 Units)

States of Matter and Solutions 5 weeks (Modern Chem. Ch. 10, 12, 13)

Content Benchmarks:

1.5 Solids, liquids, and gases differ in the energy that binds them together.

2.4 Mass is conserved in chemical reactions (balancing of equations).

Chapter 10

10.1

10.2

10.3

10.4

Chapter 12-13

12.1-2

12.3

13.1

13.2

1. The Kinetic Molecular Theory of matter

2. Liquids

3. Solids

4. Pressure and matter

5. Solutions

a. Classifying Solutions

b. Concentration

c. Net Ionic Equations

d. Concept of Colligative Properties

Acid – Base Chemistry 3.5 weeks (Modern Chem. Ch. 14, 15)

Content Benchmark: 2.1 A large number of important reactions involve the transfer of either electrons (oxidation/reduction) or hydrogen ions (acid/base reactions).

Chapter 14-15

14.1

14.3

15.1

15.2

1. Acids and Bases

2. Neutralization reactions

3. pH Calculation

4. Titration

4th Quarter

Content Standards:

1.0 Structure and Properties of Matter

All matter is made up of atoms. Its structure is made up of repeating patterns and has characteristic properties.

2.0 Chemical Reactions

A chemical reaction is a reaction in which one or more substances are converted into different substances. A chemical change cannot be reversed by physical means.

Unit 8: Reaction Rates and Equilibrium 3.5 weeks (Modern Chem. Ch 17, 18)

Content Benchmark: 2.2 The rate of chemical reactions is affected by the concentration and temperature of the reacting materials. Catalysts accelerate chemical reactions.

Chapter 17-18.

17.1-17.2

17.2

17.2

18.1

18.2

18.3

18.3

1. Rates of Reaction
 - a. Conditions that affect reaction rates
 - b. Catalysts and reaction rates
2. Reversible reactions and equilibrium
3. LeChatelier's Principle
4. Solution equilibria
5. Buffers

Unit 9: Oxidation – Reduction Reactions 3.5 weeks (Modern Chem. Ch 19, 20)

Content Benchmarks:

2.1 A large number of important reactions involve the transfer of either electrons (oxidation/reduction) or hydrogen ions (acid/base reactions).

2.4 Mass is conserved in chemical reactions (balancing of equations).

Chapter 19

19.1

19.1

19.2

Chapter 20

20.2

20.2

20.2

20.2

20.3

1. Oxidation-reduction reactions
2. Oxidation numbers
3. Balancing re-dox equations
4. Electrochemical cells
 - a. Voltaic cells
 - b. Dry Cells
 - c. Lead Storage batteries
 - d. Fuel Cells
5. Electrolysis

OPTIONAL UNITS TO BE COVERED AS TIME PERMITS

Unit 10: States of Matter Optional (Non-PASS) 3 weeks (Modern Chem. Ch 11)

Content Benchmarks:

1.5 Solids, liquids, and gases differ in the energy that binds them together

2.3 Chemical substances react in definite molar weight proportions.

2.4 Mass is conserved in chemical reactions (balancing of equations).

Chapter 11

11.2

11.2

11.2

11.2

11.2

11.3

11.3

11.4

1. The Gas Laws
 - a. Boyle's Law
 - b. Charles' Law
 - c. Gay Lussac's Law
 - d. Combined Gas Law
 - e. Avogadro's Gas Law
 - f. Ideal Gas Law
2. Gas Stoichiometry
3. Effusion and Diffusion

Unit 11: Matter and Energy Optional (Non-PASS) 2 weeks (Modern Chem. Ch 16)

Content Benchmarks:

1.5 Solids, liquids, and gases differ in the energy that binds them together.

2.2 The rate of chemical reactions is affected by the concentration and temperature of the reacting materials. Catalysts accelerate chemical reactions.

16.1

16.1

16.1

16.1

16.1

16.2

16.2

1. Temperature and Heat
2. Heat in changes of state
3. Exothermic and Endothermic Processes
4. Hess's Law
5. Energy calculations in equations
6. Entropy
7. Gibb's Free Energy

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