

**Course: Chemistry I Honors**

**Rationale:** Knowledge of chemistry is important in our current society due to the technological, medical, pharmaceutical and material advances, which make use of chemical principles. The study of chemistry helps students to understand the ongoing changes in the aforementioned fields and become informed and effective consumers, able to make sound, ethical decisions in our constantly changing society. The study of chemistry at the honors level will prepare students for the study of chemistry at the collegiate level for careers in the physical and life sciences; medicine; engineering; and other related fields.

**Course Description:** See Program of Study

**Materials:**

**STUDENT AND TEACHER TEXTBOOK:**

Modern Chemistry (Davis, Metcalfe, Williams and Castka) Holt, Rinehart and Winston Austin, TX (2002)

**SUPPORT MATERIALS:**

Holt, Rinehart and Winston Austin, TX (2002)

**HANDS-ON ACTIVITY SUPPORT MATERIALS:**

- Modern Chemistry Laboratory Manual
- Teacher Generated Laboratories
- Individual Laboratory Projects
- Group Laboratory Projects
- Laboratory Glassware
- Laboratory Hardware
- Mini-Laboratories
- Teacher Demonstrations
- Activity Worksheets

**REINFORCEMENT AND ENRICHMENT SUPPORT MATERIALS:**

- Critical Reading of Chemical Literature
- Reinforcement Activity Sheets
- Chapter Review Activity Sheets
- Chapter Review Problems

**PROGRAM RESOURCE SUPPORT MATERIALS:**

- Cross-Curricular Integration
- Technology Integration
- Sargent-Welch Periodic Chart

**Instructional Strategies:**

- Teacher – centered lecture, question and answer, demonstrations, discussions
- Laboratory Activities
- Laboratory Experiments
- Small Group, Cooperative Learning Activities
- Student – centered Independent Work

- Student – centered Research Work
- Content Relevant Writing and Reading
- Student – centered Oral Presentations
- Hands On/Project Based Learning
- Activator, Clarity, Reinforcement, Summarizer Activities
- Differentiated Instructional Strategies considering learning styles, modalities, multiple intelligences, and including pre-assessments, checking for understanding activities

**Assessments:**

- Class Participation/Behavior
- Homework
- Homework Notebook
- Laboratory Activities
- Laboratory Experiment Write-ups
- Quizzes
- Research and Report Group Presentations
- Research and Report Individual Presentations
- Unit Tests
- Laboratory Projects and Write-ups
- Reading and Reporting on Chemical Literature
- Final Exam

Check appropriate box:

<input type="checkbox"/>	<b>Quarter Course</b>	<input checked="" type="checkbox"/>	<b>Semester Course</b>	<input type="checkbox"/>	<b>Year Long Course</b>	<input type="checkbox"/>	<b>A.P. Course</b>
--------------------------	-----------------------	-------------------------------------	------------------------	--------------------------	-------------------------	--------------------------	--------------------

<b><u>General Standard/Content</u></b>	<b><u>Framework</u></b>	<b><u>Learning Objective</u></b>
Properties of Matter	1.1, 1.2, 1.3	<p>The learner will be able to:</p> <ol style="list-style-type: none"> <li>1. Define the science of chemistry</li> <li>2. List examples of the branches of chemistry</li> <li>3. Distinguish between the physical and chemical properties of matter</li> <li>4. Classify changes of matter as physical or chemical</li> <li>5. Explain the gas, liquid, and solid states of matter in terms of particles</li> <li>6. Distinguish between a mixture and a pure substance</li> </ol>
Atomic Structure	2.1 through 2.7	<ol style="list-style-type: none"> <li>1. Explain the law of conservation of mass</li> <li>2. Explain the law of definite proportions</li> <li>3. Explain the law of multiple proportions</li> <li>4. Summarize the essential points of Dalton's Atomic Theory</li> </ol>

<u>General Standard/Content</u>	<u>Framework</u>	<u>Learning Objective</u>
		<p>The learner will be able to</p> <ol style="list-style-type: none"> <li>5. Explain the relationship between Dalton's Atomic Theory and the laws of conservation of mass, definite proportions, and multiple proportions</li> <li>6. Summarize Rutherford's experiment</li> <li>7. List the properties of protons, neutrons, and electrons</li> <li>8. Define atom</li> <li>9. Explain what isotopes are</li> <li>10. Define atomic number and mass number</li> <li>11. Given the identity of a nuclide, determine its number of protons, electrons, and neutrons</li> <li>12. Define mole in terms of Avogadro's Number</li> <li>13. Define molar mass</li> <li>14. Solve problems involving mass, moles, and number of atoms of an element</li> <li>15. Discuss the dual wave-particle nature of light</li> <li>16. Describe the Bohr model of the atom</li> <li>17. Discuss deBroglie's role in the development of the quantum model of the atom</li> <li>18. Compare and contrast the Bohr model and the quantum model</li> <li>19. Explain how the Heisenberg uncertainty principle the Schroedinger wave equation led to the idea of atomic orbitals</li> <li>20. List the four quantum numbers and describe their significance</li> <li>21. Relate the number of sublevels and orbitals to the main energy level</li> <li>22. List the total number of electrons needed to fully occupy each main energy level</li> <li>23. State and apply the Aufbau principle</li> <li>24. State and apply the Pauli Exclusion principle</li> <li>25. State and apply Hund's Rule</li> <li>26. Describe the electron configurations for the atoms of any element using orbital notation, electron configuration notation, electron dot notation, and noble gas notation</li> </ol>

<u>General Standard/Content</u>	<u>Framework</u>	<u>Learning Objective</u>
Periodicity	3.1, 3.2, 3.3, 3.4	<p>The learner will be able to</p> <ol style="list-style-type: none"> <li>1. Explain the roles of Mendeleev and Moseley in the development of the periodic table</li> <li>2. Describe the modern periodic table</li> <li>3. Explain how the periodic law can be used to predict the physical and chemical properties of elements</li> <li>4. Describe how the elements belonging to a group of the periodic table are interrelated in terms of atomic number</li> <li>5. Describe the relationship between the electrons in sublevels and the length of each period of the periodic chart</li> <li>6. Locate and name the four blocks of the periodic table</li> <li>7. Discuss the relationship between group configurations and numbers</li> <li>8. Define atomic and ionic radii, ionization energy, electron affinity, and electronegativity</li> <li>9. Compare periodic trends of atomic and ionic radii, ionization energy, electron affinity, and electronegativity</li> <li>10. Define valence electrons and state how many are present in atoms of each main group element</li> <li>11. Compare the atomic and ionic radii, ionization energy, electron affinity, and electronegativity of the d-block elements and the main group elements</li> </ol>
Chemical Bonding	4.1, 4.2, 4.3, 4.4, 4.5, 4.6	<ol style="list-style-type: none"> <li>1. Types of chemical bonding</li> <li>2. Ionic vs. covalent bonding</li> <li>3. Formation of covalent bonds</li> <li>4. Characteristics of the covalent bond</li> <li>5. The octet rule</li> <li>6. Lewis structures: single, double, and triple covalent bonds</li> <li>7. Pure, polar, and non-polar covalent bonds</li> <li>8. Resonance structures</li> <li>9. Characteristics of the ionic bond</li> <li>10. Comparison of ionic and covalent bonds</li> <li>11. Writing ionic compounds</li> <li>12. Metallic bonds</li> <li>13. VESPR theory of molecular shape</li> <li>14. Hybridization</li> </ol>

<u>General Standard/Content</u>	<u>Framework</u>	<u>Learning Objective</u>
Chemical Reactions and Stoichiometry	5.1, 5.2, 5.3, 5.4, 5.5, 5.6	<p>The learner will be able to</p> <p>15. Molecular polarity and dipole-dipole forces</p> <p>16. Hydrogen bonding</p> <p>17. Nomenclature of ionic compounds and covalent compounds</p> <p>18. Naming Group I, II, and III metal compounds</p> <p>19. Naming transition metal compounds</p> <p>20. Naming covalent compounds</p> <p>21. Writing chemical formulas from chemical names</p> <p>1. Molar mass: definition and calculations</p> <p>2. Percent Composition: definition and calculations</p> <p>3. The law of multiple proportions</p> <p>4. The mole concept: definition and calculations</p> <p>5. Avogadro's number: definition and calculations</p> <p>6. Empirical Formulas: definition and calculations</p> <p>7. Empirical Weight: definition and calculations</p> <p>8. Molecular Formulas: definition and calculations</p> <p>9. Molecular Weight: definition and calculations</p> <p>10. Indicators of chemical reactions</p> <p>11. Characteristics of chemical equations and reactions</p> <p>12. Synthesis reactions: recognition, completion, and balancing</p> <p>13. Decomposition reactions: recognition, completion, and balancing</p> <p>14. Single replacement reactions: recognition, completion, and balancing</p> <p>15. Double replacement reactions: recognition, completion, and balancing</p> <p>16. Combustion reactions: recognition, completion, and balancing</p> <p>17. Stoichiometry: stepwise method of solution</p> <p>18. Stoichiometry: calculations</p> <p>19. Limiting reactants: definition and calculations</p> <p>20. Percent yield: definition and calculations</p>

<u>General Standard/Content</u>	<u>Framework</u>	<u>Learning Objective</u>
States of Matter, Kinetic Molecular Theory, and Thermochemistry	6.1, 6.2, 6.3, 6.4, 6.5	<p>The learner will be able to</p> <ol style="list-style-type: none"> <li>1. Kinetic molecular theory of gases</li> <li>2. Properties of gases</li> <li>3. Deviations of real gases from ideal gas behavior</li> <li>4. Pressure</li> <li>5. Units of pressure</li> <li>6. Standard temperature and pressure</li> <li>7. Boyle's Law: theory and calculations</li> <li>8. The Kelvin temperature scale</li> <li>9. Charles' Law: theory and calculations</li> <li>10. Gay-Lussac's Law: theory and calculations</li> <li>11. The combined law: theory and calculations</li> <li>12. Dalton's Law of Partial Pressure: theory and calculations</li> <li>13. Gases collected by water displacement: theory and calculations</li> <li>14. The law of combining volumes</li> <li>15. Avogadro's Law</li> <li>16. Molar Volume: theory and calculations</li> <li>17. The ideal gas law: theory and calculations</li> <li>18. The ideal gas law constant</li> <li>19. Molar mass or density determinations using the ideal gas law</li> <li>20. Stoichiometry of gases</li> <li>21. Volume-volume calculations</li> <li>22. Volume-mass calculations</li> <li>23. Mass-volume calculations</li> <li>24. Graham's law of effusion: theory and calculations</li> <li>25. Application of Graham's law of effusion</li> </ol>
Solutions, Rates of Reactions, and Equilibrium	7.1, 7.2, 7.3, 7.4, 7.5, 7.6	<ol style="list-style-type: none"> <li>1. Properties of liquids and the kinetic-molecular theory</li> <li>2. Evaporation and boiling</li> <li>3. Phase changes: boiling and freezing</li> <li>4. Properties of solids and the kinetic-molecular theory</li> <li>5. Crystalline solids</li> <li>6. Crystal binding forces</li> <li>7. Crystal structures</li> <li>8. Amorphous solids</li> <li>9. Equilibrium</li> <li>10. Equilibrium equations and phase changes</li> <li>11. LeChatelie's principle</li> </ol>
<u>General Standard/Content</u>	<u>Framework</u>	<u>Learning Objective</u>

<p>Acids and Bases and Oxidation-Reduction Reactions</p>	<p>8.1, 8.2, 8.3, 8.4</p>	<p>The learner will be able to</p> <ol style="list-style-type: none"> <li>12. Equilibrium vapor pressure</li> <li>13. Molar heat of vaporization</li> <li>14. Molar heat of fusion</li> <li>15. Phase changes</li> <li>16. Structure of water</li> <li>17. Physical properties of water</li> </ol> <ol style="list-style-type: none"> <li>1. Draw the structure of the hydronium ion</li> <li>2. Distinguish between strong and weak electrolytes.</li> <li>3. List five general properties of aqueous acids and bases.</li> <li>4. Name common binary and ternary acids given their formulas.</li> <li>5. Define acid and base according to Arrhenius's theory of ionization.</li> <li>6. Explain the difference between strong and weak acids and bases.</li> <li>7. Define and recognize Bronsted-Lowry acids and bases.</li> <li>8. Define a Lewis acid and base</li> <li>9. Describe a conjugate acid and base system.</li> <li>10. Describe and recognize an amphoteric compound.</li> <li>11. Explain the process of neutralization.</li> <li>12. Describe the self-ionization of water.</li> <li>13. Define pH</li> <li>14. Explain and use the pH scale</li> <li>15. Calculate pH given the hydronium ion or hydroxide ion concentration.</li> <li>16. Calculate the hydronium ion and hydroxide ion concentration given pH.</li> <li>17. Describe how an acid-base indicator functions.</li> <li>18. Describe what an acid-base titration is.</li> <li>19. Calculate the molarity of a solution from titration data.</li> <li>20. Explain strong acid – strong base titration systems.</li> <li>21. Explain strong acid – weak base titration systems</li> <li>22. Explain weak acid – strong base titration systems</li> <li>23. Explain weak acid – weak base titration systems</li> <li>24. Describe oxidation and reduction reactions and give common examples</li> <li>25. assign oxidation numbers in chemical reactions.</li> </ol>
--	---------------------------	--

