

# WINTHROP HIGH SCHOOL

## Honors Chemistry Syllabus

### Course Overview

This is a first year survey course for highly motivated students that will rely largely on individual responsibility for personal education. Students will analyze patterns in laboratory data to develop an understanding of fundamental topics in chemistry including, but not limited to laboratory procedures, atomic theory, periodicity, chemical bonding, stoichiometry, phases of matter, chemical reactions, kinetics, equilibrium, thermodynamics and acid/ base chemistry. Students will be assessed on their ability to apply fundamental chemical principles to broader situations. By the completion of the course, students will develop laboratory techniques and refine their analytical and critical thinking skills.

### Materials

We will use the online textbook resources from [www.ck12.org](http://www.ck12.org)

### Curriculum Content Map

Unit	Sect	Title	Topics of Study
<b>1 The Structure of Matter</b>	<b>I</b>	<b>An Introduction to Matter</b>	<ul style="list-style-type: none"><li>• Lab Safety</li><li>• Scientific Method</li><li>• Chemical and Physical changes</li><li>• Classification of Matter</li><li>• Drawings of each type of matter</li></ul>
	<b>II</b>	<b>An Introduction to the Atom</b>	<ul style="list-style-type: none"><li>• Atomic History</li><li>• Atomic Structure</li><li>• Valence and Core electrons</li><li>• Ions and common ionic charge</li><li>• Isotope notation</li><li>• Light/ Energy</li><li>• Electron Configurations</li></ul>
<b>2 The Formation of Matter</b>	<b>I</b>	<b>Periodic Trends, the Periodic Table and Bonding</b>	<ul style="list-style-type: none"><li>• Periodic Table</li><li>• Coulombic Charge</li><li>• Electronegativity</li><li>• Periodic Trends</li><li>• Bonding, covalent, ionic, metallic and network covalent</li><li>• Types of Solids</li><li>• Drawings of various types of bonding as well as solids.</li></ul>
	<b>II</b>	<b>Ionic and Molecular Compounds</b>	<ul style="list-style-type: none"><li>• Lewis Structures</li></ul>

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			<ul style="list-style-type: none"> <li>• Ionic compound naming and formula writing</li> <li>• Naming covalent compounds</li> <li>• Drawing Lewis Structures for covalent compounds</li> <li>• Covalent compound molecular geometries through <math>AX_4</math></li> <li>• Molecular polarity</li> </ul>
<b>3</b> <b>Interactions of Matter</b>	<b>I</b>	<b>Interactions between Molecules</b>	<ul style="list-style-type: none"> <li>• Types of Intermolecular Forces.</li> <li>• Predicting intermolecular forces based on molecular structure.</li> <li>• Drawings representing intermolecular forces and molecular structure.</li> <li>• Properties of substances and intermolecular forces; Vapor pressure, freezing and melting points.</li> <li>• Phase changes and IMF's - Heating and Cooling Curves and Phase Diagrams</li> <li>• Organic molecules and functional groups</li> </ul>
	<b>II</b>	<b>Gases</b>	<ul style="list-style-type: none"> <li>• Kinetic Molecular Theory</li> <li>• Combined Gas Law, Boyle's Law, Charles's Law, Guy-Lussac's Law, Avogadro's Law and Ideal Gas Law</li> <li>• Dalton's Law of Partial Pressure</li> </ul>
<b>4</b> <b>Transformations of Matter</b>	<b>I</b>	<b>Chemical Reactions</b>	<ul style="list-style-type: none"> <li>• Writing out Chemical Reactions from sentence structures.</li> <li>• Writing out sentence structures from chemical reactions.</li> <li>• Naturally occurring diatomics.</li> <li>• Predicting and identifying physical and chemical changes from chemical reactions.</li> <li>• Balancing chemical reactions.</li> <li>• Classifying chemical reactions by reaction type; single replacement, double replacement, synthesis, decomposition, combustion.</li> <li>• Classifying chemical reactions by driving forces; formation of a solid (precipitation), formation of water (acid/ base) and transfer of electrons (reduction/ oxidation).</li> </ul>

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			<ul style="list-style-type: none"> <li>Drawing models of physical and chemical changes in reactions with correct stoichiometric ratios.</li> </ul>
	II	<b>Aqueous Reactions - Formation of Water and Precipitates</b>	<ul style="list-style-type: none"> <li>Draw and describe the process of dissolution with the proper solute/ solvent interactions.</li> <li>Draw and describe the precipitation and acid/ base aqueous solutions.</li> <li>Predicting Products of precipitate and acid base (Lewis Acid/Lewis Base) reactions.</li> <li>Draw and describe the difference between strong and weak acids and bases.</li> <li>Writing Ionic and Net Ionic Equations for precipitation and acid/ base reactions.</li> <li>Identify spectator ions.</li> </ul>
	III	<b>Transfer of Electrons</b>	<ul style="list-style-type: none"> <li>Identify reduction/ oxidation reactions.</li> <li>Identify the elements involved in the reduction/ oxidation.</li> <li>Identify the number of electrons exchanged.</li> <li>Write out half reactions for simple reduction/ oxidation reactions.</li> </ul>
<b>5 Quantifying Transformations of Matter</b>	I	<b>Measurements, the Mole, Empirical and Molecular Formulas</b>	<ul style="list-style-type: none"> <li>Recording measurements using the proper number of significant figures.</li> <li>Identifying the number of significant figures in a measurement.</li> <li>Predicting the number of significant figures in a calculation.</li> <li>Understand the concept of weighing by counting and relative mass.</li> <li>The Mole concept, molar mass, relative number of particles in a mole, the volume of a Mole of any gas at STP.</li> <li>Single step and multi-step mole calculations.</li> <li>The concept of percent composition and calculations involving percent composition.</li> <li>Concept of empirical and molecular formulas.</li> <li>Calculating empirical and molecular formulas from percent composition and experimental data.</li> <li>Hydrates</li> </ul>

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	II	<b>Stoichiometry, Limiting Reactant, Percent Yield</b>	<p>Calculations involving simple and complex word problems on the following topics:</p> <ul style="list-style-type: none"> <li>● Stoichiometric Mole Ratios</li> <li>● Limiting Reactant</li> <li>● Percent Yield</li> </ul>
<b>6 Changes in Matter of Solutions</b>	I	<b>Properties and Quantities</b>	<ul style="list-style-type: none"> <li>● Molarity</li> <li>● Solution Stoichiometry</li> <li>● Acid/ Base titrations</li> <li>● Serial Dilutions</li> </ul>
<b>7 Energy Exchange in Transformations of Matter</b>	I	<b>Basics of Heat and Energy Exchange in Chemical Reactions</b>	<ul style="list-style-type: none"> <li>● Describing heat flow.</li> <li>● Measuring heat flow using calorimetry.</li> <li>● Heat of Fusion</li> <li>● Enthalpy</li> <li>● Energy diagrams</li> </ul>

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### *Vision of the Graduate*

*Winthrop High School strives to ensure its graduates are able to become productive citizens of their town, their state, and their nation. To do this, the school in 2011 embraced the following learning objectives, on which students are evaluated quarterly. Taken together, they express a community vision for what we want our graduates to be, know, and do.*

***WHS Students will become...***

#### ***Critical Thinkers***

- They will use, apply, and evaluate multiple problem-solving strategies in a variety of Disciplines.
- They will be able to select, organize, and evaluate new ideas.
- They will demonstrate the ability to actively and critically read.
- They will develop the skills and acquire the knowledge necessary to prepare them for college and career success
- They will be able to set priorities, and manage their time and tasks.

#### ***Effective Communicators***

- They will communicate ideas and information with clarity and with an understanding of their audience.
- They will integrate and use a variety of communication forms.
- They will listen effectively and respond appropriately to spoken communication.
- They will master standard English-language conventions.

#### ***Conscientious Citizens***

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- They will be aware of, and follow, their community's rules and laws
- They will respect themselves and the community at large.
- They will be aware of and respect social and cultural diversity.
- They will understand, promote, and show the importance of hard work to achieve success.
- They will own their mistakes, and will learn from them.

### ***Creative Achievers***

- They will show curiosity and enthusiasm in everything they do.
- They will work and think originally.
- They will appreciate the arts in their many forms.
- They will select, organize, and develop innovative ideas.
- They will build off the ideas of others.