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 predominantly use the online textbook resources from www.ck12.org In the event we migrate to using a physical textbook we will use *Chemistry* by Davis, Masterton and Hurley; Thomson Brook/Cole; 2004 ISBN 0-534-40878-8

Curriculum Content Map

Unit	Sect	Title	Topics of Study
1 The Structure of Matter	**I**	**An Introduction to Matter**	● Lab Safety ● Chemical and Physical changes ● Scientific Method ● Periodic Table ● Classification of Matter ● Drawings of each type of matter ● Phases of Matter, including phase diagrams ● Drawings of each phase of matter
	II	**An Introduction to the Atom**	● Atomic History ● Atomic structure ● Valence and Core electrons ● Ions and common ionic charge ● Isotope notation ● Electron Configurations ● Light/ Energy
2	**I**	**Periodic Trends, the Periodic Table and Bonding**	● Coulombic Charge ● Electronegativity ● Periodic Trends

The Formation of Matter			● Bonding, covalent, ionic, metallic and network covalent ● Types of Solids ● Drawings of various types of bonding as well as solids.
	II	**Ionic and Molecular Compounds**	● Lewis Structures ● Ionic compound naming and formula writing ● Naming covalent compounds ● Drawing Lewis Structures for covalent compounds ● Covalent compound molecular geometries through AX_4 ● Molecular polarity
3 Interactions of Matter	**I**	**Interactions between Molecules**	● Types of Intermolecular Forces. ● Predicting intermolecular forces based on molecular structure. ● Drawings representing intermolecular forces and molecular structure. ● Properties of substances and intermolecular forces; Vapor pressure, freezing and melting points. ● Phase changes and IMF's - Heating and Cooling Curves and Phase Diagrams ● Organic molecules and functional groups
	II	**Gases**	● Kinetic Molecular Theory ● Combined Gas Law, Boyle's Law, Charles's Law, Guy-Lusssac's Law, Avogadro's Law and Ideal Gas Law ● Dalton's Law of Partial Pressure
4 Transformations of Matter	**I**	**Chemical Reactions**	● Writing out Chemical Reactions from sentence structures. ● Writing out sentence structures from chemical reactions. ● Naturally occuring diatomics. ● Predicting and identifying physical and chemical changes from chemical reactions. ● Balancing chemical reactions. ● Classifying chemical reactions by reaction type; single replacement, double

			replacement, synthesis, decomposition, combustion. ● Classifying chemical reactions by driving forces; formation of a solid (precipitation), formation of water (acid/ base) and transfer of electrons (reduction/ oxidation). ● Drawing models of physical and chemical changes in reactions with correct stoichiometric ratios.
	II	**Aqueous Reactions - Formation of Water and Precipitates**	● Draw and describe the process of dissolution with the proper solute/ solvent interactions. ● Draw and describe the precipitation and acid/ base aqueous solutions. ● Predicting Products of precipitate and acid base (Lewis Acid/Lewis Base) reactions. ● Draw and describe the difference between strong and weak acids and bases. ● Writing Ionic and Net Ionic Equations for precipitation and acid/ base reactions. ● Identify spectator ions.
	III	**Transfer of Electrons**	● Identify reduction/ oxidation reactions. ● Identify the elements involved in the reduction/ oxidation. ● Identify the number of electrons exchanged. ● Write out half reactions for simple reduction/ oxidation reactions.
5 Quantifying Transformations of Matter	**I**	**Measurements, the Mole, Empirical and Molecular Formulas**	● Recording measurements using the proper number of significant figures. ● Identifying the number of significant figures in a measurement. ● Predicting the number of significant figures in a calculation. ● Understand the concept of weighing by counting and relative mass. ● The Mole concept, molar mass, relative number of particles in a mole, the volume of a Mole of any gas at STP. ● Single step and multi-step mole calculations. ● The concept of percent composition and calculations involving percent composition.

			● Concept of empirical and molecular formulas. ● Calculating empirical and molecular formulas from percent composition and experimental data. ● Hydrates
	II	**Stoichiometry, Limiting Reactant, Percent Yield**	Calculations involving simple and complex word problems on the following topics: ● Stoichiometric Mole Ratios ● Limiting Reactant ● Percent Yield
6 Changes in Matter of Solutions	**I**	**Properties and Quantita**	● Molarity ● Solution Stoichiometry ● Acid/ Base titrations ● Serial Dilutions
7 Energy Exchange in Transformations of Matter	**I**	**Basics of Heat and Energy Exchange in Chemical Reactions**	● Describing heat flow. ● Measuring heat flow using calorimetry. ● Heat of Fusion ● Enthalpy ● Energy diagrams