Chemistry (Honors)

Chemistry: Grades 11 & 12				
Learning Standards	**Objectives**	**Resources**	**Time Allotment**	**SHS Student Expectations**
Learning Standard #1 Properties of Matter				
Learning Standard # 1.1 Physical properties	The student will be able to: • Identify and explain some of the physical properties that are used to classify matter. • Identify and explain some of the chemical properties that are used to classify matter.	Video: The Scientific Method Zumdahl: ch. 1 pgs. 10-13 ch. 2 pgs. 15-24 ch. 3 pgs 61-68 Lab: Chemical and Physical properties Demo: Combustion of Mg Fe + S	4 days	1,2, 3, 5
Learning Standard # 1.2 Mixtures and pure substances	The student will be able to:. • Explain the difference between mixtures and pure substances • Use the periodic table to name/write symbols of the elements. • Use scientific notation and proper units	Zumdahl: ch. 3 pgs 69-72 Lab: Conservation of Mass	4 days	1,2, 3, 5
Learning Standard # 1.3 Four states of matter	The student will be able to: • Describe the four states of matter in terms of energy, particle motion, and phase transition. • Express calculations with proper significant figures	Zumdahl: ch.3 pgs. 73-83 ch. 2 pgs.25-37 Lab: Melting Point Video: A Matter of State Demo: Acetone and styrofoam	4 days	1,2, 3, 5
Learning Standard # 1.4 Chemical and physical change	The student will be able to: • Distinguish between chemical and physical changes	Zumdahl: ch. 3 pgs. 61-68	3 days	1, 3, 5
Learning Standard # 2 Atomic Structure				
Learning Standard # 2.1 Atomic theory	The student will be able to: • Trace the development of atomic theory and the structure of the atom	Zumdahl: ch. 4 pgs. 90-99 Lab: Dart analogy	3 days	1,2, 3, 5

	from the ancient Greeks to the present. • Interpret Dalton's Atomic Theory in terms of the Laws of Conservation of Mass, Constant Composition, and Multiple Proportions.			
Learning Standard # 2.2 Atomic structure	The student will be able to: • Identify the major components of the atom. • Explain how they interact. • Define and recognize isotopes	Zumdahl: ch. 4 pgs. 100-108 Video: The Busy Electron Video: The Proton in Chemistry	3 day	1, 3, 5
Learning Standard # 2.3 Electromagnetic spectrum	The student will be able to: • Describe the electromagnetic spectrum in terms of wavelength and energy • Identify regions of the electromagnetic spectrum • Understand that matter has properties of both particles and waves • Show how the emission spectrum of hydrogen demonstrates the quantized nature of energy • Describe the Bohr model of the atom	Transparencies Video: Color Zumdahl: ch. 11pgs. 329-345	3 days	1, 3, 5

Learning Standard # 2.4 Electron configuration	The student will be able to: • Write electron configuration (spdf notation) • Write orbital notation • Write Lewis electron dot structures	Lab: Molecular Models Video: Electron Configuration Zumdahl: ch. 11 pgs. 345-354	2 days	1,2, 3, 5
Learning Standard # 2.5 Nuclear chemistry	The student will be able to: • Compare nuclear fission and nuclear fusion and mass defect • Describe the process of radioactive decay as the spontaneous breakdown of certain unstable	Zumdahl: ch 19 pgs. 624-644 Video: Nuclear Energy	5 days	1,2, 3, 5

	elements (radioactive) into new elements (radioactive or not) • Describe alpha, beta and gamma particles • Write balanced nuclear reactions • Explain the difference between stable and unstable isotopes • Explain the concept of half life of a radioactive element • Show how radiation damages human tissue			
Learning Standard # 3 Periodicity				
Learning Standard # 3.1 Element arrangement	• Explain the relationship of an element's position on the periodic table to its atomic number and mass • Use the periodic table to identify metal, nonmetals, and metalloids • Use the periodic table to identify families (groups), periods, valence electrons and reactivity with other elements	Lab: Periodicity Video: The Power of the Periodic Table Zumdahl: ch. 4 pgs 105- 110 Demo: Na and K in Water	6 days	1,3,5
Learning Standard # 3.2 Electron configuration	• Relate the position of an element on the periodic table to its electron configuration	Zumdahl: pgs 345-352	2 days	1,5
Learning Standard # 3.3 Periodic trends	• Identify trends on the periodic table (ionization energy, electronegativity, electron affinity, and relative size of atoms and ions	Zumdahl: ch 11 pgs 353-362 Lab: Periodic Table Demo: Acids/metals	3 days	1,2,3,4,5
Learning Standard # 4 Chemical Bonding				
Learning Standard # 4.1 Ionic and covalent bonds	• Explain how elements combine to form compounds through both ionic and covalent bonding	Zumdahl: ch 12 pgs 366-368 Lab: Ionic and Covalent Bonds	4 days	1,2,3

Learning Standard # 4.2 Molecular models	• Draw Lewis dot structures for simple and complex molecules • Draw orbital models for simpleand complex molecules • Relate electronegativity and ionization energy to the type of bonding an element is likely to undergo • Predict the geometry of simple molecules and their polarity (VSEPR theory)	Zumdahl: ch 12 pgs 369-382 Lab: Molecular Model kit Video: Chemical Bonds	5 days	1,2,3,4,5
Learning Standard # 4.3 Chemical formulas	• Predict chemical formulas based on the number of valence electrons • Name and write the chemical formulas for simple ionic and molecular compounds, including those that contain common polyatomic ions • Name common acids and bases	Zumdahl: ch. 5 pgs 118-155 Lab: Set 1 reactions between ions	3 days	1,2,3,4
Learning Standard # 5 Chemical reactions and Stoichiometry				
Learning Standard # 5.1 Stoichiometry	• Balance chemical reactions by applying the law of conservation of mass • Calculate % yield • Calculate mass-mass, mass-volume, and volume-volume problems for chemical reactions • Recognize the limiting reactant in a reaction	Zumdahl: ch 6 pgs 174-182 Zumdahl: ch 10 pgs 284-310 Lab: Copper and Sulfur	4 days	1,2,3,4
Learning Standard # 5.2 Types of chemical reactions	• Recognize synthesis, decomposition, single displacement, double displacement, and neutralization reactions • Predict whether a reaction will occur	Zumdahl: ch. 8 pgs 226-231 ch. 7 pgs 190-200 Lab: Types of reactions Lab: Mg + HCl	5 days	1,2,3,4

Learning Standard # 5.3 Mole Concept	• Understand the mole concept in terms of number of particles, mass, and gaseous volume • Calculate molar mass, % composition, empirical formulas, and molecular formulas	Zumdahl: ch 9 pgs 236- 274 Lab: Mole/Mass Lab: Determination of the percentage of water in a hydrate	5 days	1,2,3,4,5
Learning Standard # 6 Gases and Kinetic molecular theory				
Learning Standard # 6.1 Laws of ideal gases: equation of state for an ideal gas	The student will be able to: • Use the ideal gas law. • Describe and use Boyle's and Charles' Laws • Define the molar volume for an ideal gas. • Define Absolute zero and STP.	Lab: Determination of the molar volume of a gas Lab: Determination of R Zumdahl: ch. 13 pgs. 406-427	4 days	1,2, 3, 5
Learning Standard # 6.2 Laws of ideal gases: partial pressures	The student will be able to: • State the relationship between partial pressures and total pressure and between partial pressure and mole fraction.	Demo: Collapsing can Zumdahl: ch. 13 pgs. 428-434	2 days	1, 3, 5
Learning Standard # 6.3 Kinetic molecular theory: interpretation of ideal gas laws on the basis of this theory	The student will be able to: • Present the basic postulates of the kinetic molecular theory.	Video: The Precious Envelope Zumdahl: ch 13 pgs. 435-437 Lab: Oxygen and Hydrogen	5 days	1,2, 3, 5
Learning Standard # 6.4 Kinetic molecular theory: Avogadro's hypothesis and the mole concept	The student will be able to: • Do stoichiometric calculations for reactions involving gases. • Calculate molar mass from gas density.	Zumdahl : ch. 13 pgs. 437-441	3 days	1,2, 3,4, 5
Learning Standard # 6.5 Kinetic molecular theory: dependence of kinetic energy of molecules on temperature	The student will be able to: • Define temperature. • Describe effusion and diffusion.	Zumdahl: ch. 13 pg. 436	1 day	1, 3, 5
Learning Standard # 7 Solutions				

Learning Standard # 7.1 Solution process	The student will be able to: • Describe the process by which solutes dissolve in solvents • Use a solubity curve to determine saturation values at different temperatures • Define and calculate the concentration term mass per cent	Zumdahl: ch. 15 pgs. 481-488 Lab: Solutions	3 days	1,2, 3,4, 5
Learning Standard # 7.2 Rate of dissolving	The student will be able to: • Identify and explain the factors that affect the rate of dissolving • Calculate concentration in terms of molarity • Explain normality	Zumdahl: ch. 15 pgs. 488-496, 503- 508 Lab: Molarity	4 days	1,2, 3,4, 5
Learning Standard # 7.3 Ionic equations	The student will be able to: • Write dissociation, overall, and net ionic equations for precipitation reactions in aqueous solutions • Predict possible products for ionic equations of precipitation reactions in aqueous solutions • Solve stoichiometric problems for solution reactions	Zumdahl: ch. 7 pgs. 201-204 ch. 15 pgs 497-500 Lab: Writing Equations Sets 2-5	6 days	1,2, 3,4, 5
Learning Standard # 8 Acids and Bases				
Learning Standard # 8.1 Acid-base theory	The student will be able to: • Define Arrhenius' theory of acids and bases in terms of the presence of hydronium and hydroxide ions • Define Bronsted's theory of acids and bases in terms of proton donor and acceptor • Relate acid-base concentrations to the pH scale	Zumdahl: ch. 17 pgs. 560-577 Lab: Titration of acid/base Davis: ch. 15 pgs. 485-488	5 days	1,2, 3,4, 5
Learning Standard # 8.2 Acid-base neutralization	The student will be able to: • Describe an acid-base titration and identify the equivalence point • Calculate the pH of aqueous solutions	Zumdahl: ch. 15 pgs. 501-503 Lab: Titration of vinegar Demo: acids/indicators	5 days	1,2, 3,4, 5

	• Explain how indicators are used in titrations and how they are selected • Calculate neutralization reactions			
Learning Standard # 9 Equilibrium and Kinetics				
Learning Standard # 9.1 Equilibrium expression	The student will be able to: • Write the equilibrium expression and calculate the equilibrium constant for a reaction • Write and solve solubility products for salts • Write and solve solubility products for acids	Zumdahl: ch 16 pgs. 525-532, 544-550	4 days	1,2, 3
Learning Standard # 9.2 LeChatelier's principle	The student will be able to: • Predict the shift in equilibrium when the system is subjected to a stress • Identify the factors that affect the rate of a chemical reaction (temperature, concentration) and the factors that can cause a shift in equilibrium (concentration, pressure, volume, temperature)	Zumdahl: ch. 16 pgs. 536-545 Demo: Equilibrium shifts Lab: LeChatelier's Principle	5 days	1,2, 3,4, 5
Learning Standard # 9.3 Reaction rate	The student will be able to: • Explain rates of reaction in terms of collision frequency, energy of collisions, and orientation of colliding molecules. • Define the role of activation energy in a chemical reaction • Sketch and label a kinetic energy distribution curve and a potential energy diagram • Explain how a catalyst speeds up a chemical reaction	Zumdahl: ch. 16 pgs. 522-525 Video: Driving Forces Lab: Equilibrium	6 days	1, 3, 5
Learning Standard # 10 Thermochemistry (Enthalpy)				

Learning Standard # 10.1 Law of conservation of energy	The student will be able to: • Interpret the law of conservation of energy	Zumdahl: ch. 13 pages 73-77	2 days	1, 3, 5
Learning Standard # 10.2 Energy changes	The student will be able to: • Analyze the energy changes involved in physical and chemical processes • Calculate heat of reaction using Hess's Law	Zumdahl: ch. 13 pgs. 78-79 Lab: Hess's Law	4 days	1,2, 3,4, 5
Learning Standard # 11 Oxidation-Reduction and Electrochemistry				
Learning Standard # 11.1 Oxidation-Reduction	The student will be able to: • Describe the chemical processes known as oxidation-reduction • Assign oxidation numbers • Balance oxidation-reduction equations	Zumdahl: ch. 18 pgs. 588-604 Demo: Rapid oxidation of hydrogen peroxide Lab: Oxidation-Reduction	4 days	1,2, 3,4, 5
Learning Standard # 11.2 Electrochemistry	• Explain how a typical battery works	Zumdahl: ch. 18 pgs. 604-612 Lab: Electrochemistry	3 days	1,3,5

Learning Standard # 12 Descriptive chemistry				
Learning Standard # 12.1 Chemical reactivity and products of chemical reactions	The student will be able to: • Predict the products of chemical reactions. • Write complete, balanced chemical equations for chemical reactions.	Zumdahl: ch. 7 pgs. 190-204 Lab: Colorful precipitates	4 days	1,2, 3,4, 5

Learning Standard # 12.2 Relationships in the periodic table; horizontal, vertical, and diagonal with examples of from alkali metals, alkaline earth metals, halogens, and the first series of transition elements	The student will be able to: • Show general trends in ionization energy, electron affinity, and atomic radius in the periodic table. • Show what types of information can be obtained from the periodic table.	Zumdahl: ch 11 pgs 353-358 Video: Periodic Table Lab: Periodicity	5 days	1,2, 3,4, 5
Learning Standard # 12.3 Introduction to organic chemistry:	The student will be able to: • Name simple alkanes, alkenes, and alkynes.	Zumdahl: ch 20 pgs 654-697 Lab: Polymers Video: The Age of Polymers	4 days	1, 3, 5

hydrocarbons and functional groups	• Discuss isomerism in organic molecules. • Recognize basic organic functional groups.			
Learning Standard # 13 Laboratory		All of the labs listed above pertain to this standard. Students keep a laboratory notebook of all of their labs.		
Learning Standard # 13.1 Making observations of chemical reactions and substances	The student will be able to: • Observe chemical reactions in the laboratory.	All labs	Continual	1,2, 3,4, 5
Learning Standard # 13.2 Recording data	The student will be able to: • Record accurate and precise data.	All labs	Continual	1,2, 3,4, 5
Learning Standard # 13.3 Calculating and interpreting results based on the quantitative data obtained	The student will be able to: • Perform calculations describing laboratory experiments. • Interpret the data and calculations of an experiment to reach conclusions about that experiment.	All labs	Continual	1,2,3,4, 5
Learning Standard # 13.4 Communicating effectively the results of experimental work	The student will be able to: • Write a conclusion summing up the laboratory results and explaining the chemical implications of an experiment.	All labs	Continual	1,2, 3,4, 5