Science
Chemistry: Honors
Unit 2: Chemical Reactivity

Essential Understandings	▪ Combining knowledge of atomic structure with an awareness of how substances achieve their highest levels of chemical stability, students can begin to predict formulas for compounds, and the qualitative and quantitative outcomes of chemical reactions.
Essential Questions	▪ What is the outcome when an atom becomes an ion? ▪ How do ions combine to form chemical formulas? ▪ How do atoms combine to form molecules? ▪ How does one represent a chemical reaction, both qualitatively and quantitatively? ▪ How does a balanced chemical reaction allow one to predict the amount of any of its members if the amount of only one member is known?
Essential Knowledge	▪ One can predict the type and magnitude of charges of most of the elemental ions by using the periodic table of the elements. ▪ The rules of systematic nomenclature allow one to determine the formulae of polyatomic ions and molecules. ▪ A balanced chemical reaction can be used to construct a solution to a quantitative problem.

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Vocabulary	▪ Terms: ○ acid, anion, base, binary compound, cation, chemical formula, formula unit, group, ion, ionic compound, metal, metalloid, molecule, molecular compound, molecular formula, nonmetal, periodic table, polyatomic ion, representative element, semimetal, ternary compound, transition metal, Avogadro's number, empirical formula, gram atomic mass, gram formula mass, gram molecular mass, molar mass, molar volume, mole, percent composition, representative particle, standard temperature and pressure, activity series of metals, balanced equation, catalyst, chemical equation, coefficient, combination reaction, combustion reaction, decomposition reaction, double replacement reaction, single replacement reaction, skeleton equation, actual yield, endothermic reaction, exothermic reaction, enthalpy, excess reagent heat of combustion, heat of reaction, limiting reagent, percent yield, standard heat of formation, stoichiometry, theoretical yield, thermochemical equation, amorphous solid, atmospheric pressure, Avogadro's hypothesis, barometer, boiling point, crystal, evaporation, gas pressure, heat of condensation, heat of fusion, heat of solidification, heat of vaporization, kinetic theory, melting point, millimeter of mercury, normal boiling point, pascal, phase change, standard atmosphere, sublimation, supercooled liquid, unit cell, vapor pressure, vaporization, Boyle's law, Charles' law, combined gas law, Dalton's law of partial pressures, diffusion, effusion, Gay-Lussac's law, Graham's law of effusion, ideal gas constant, ideal gas law, partial pressure
Essential Skills	▪ Use the periodic table and the rules of nomenclature to write the correct formulas of compounds, given the systematic names, and vice versa. ▪ Write and balance a chemical equation. ▪ Use partial quantitative information, in conjunction with a balanced chemical equation, to find other quantitative information about the chemical reaction in question.

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Related Maine Learning Results	D. The Physical Setting D3. Matter and Energy Students describe the structure, behavior, and interactions of matter at the atomic level and the relationships between matter and energy. a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties. b. Describe how the number and arrangement of atoms in a molecule determine a molecule's properties, including the types of bonds it makes with other molecules and its mass, and apply this to predictions about chemical reactions. c. Explain the essential roles of carbon and water in life processes. d. Describe how light is emitted and absorbed by atoms' changing energy levels, and how the results can be used to identify a substance. e. Describe factors that affect the rate of chemical reactions (including concentration, pressure, temperature, and the presence of molecules that encourage interaction with other molecules. f. Apply an understanding of the factors that affect the rate of chemical reaction to predictions about the rate of chemical reactions. g. Describe nuclear reactions, including fusion and fission, and the energy they release. h. Describe the radioactive decay and half-life. i. Explain the relationship between kinetic and potential energy and apply the knowledge to solve problems. j. Describe how in energy transformations the total amount of energy remains the same, but because of inefficiencies (heat, sound, and vibration) useful energy is often lost through radiation or conduction. k. Apply an understanding of energy transformations to solve problems. l. Describe the relationship among heat, temperature, and pressure in terms of the actions of atoms, molecules, and ions.

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Sample Lessons And Activities	▪ Laboratory Exercise: "Nomencalture is Fun!" ▪ Laboratory Exercise: Identification of Anions in Solution ▪ Laboratory Exercise: Precipitation Reactions ▪ Laboratory Exercise: Types of Chemical Reactions ▪ Laboratory Exercise: Heat of Reaction ▪ Laboratory Exercise: What is the Molar Volume of a Gas? ▪ Laboratory Exercise: Graham's Law
Sample Classroom Assessment Methods	▪ Quizzes ▪ Laboratory Reports ▪ Exams
Sample Resources	▪ Publications: o Chemistry, Wilbraham, Stanley, Simpson and Matta o ChemMatters, a periodical for students published by the American Chemical Society o Selected software tutorial programs in the Learning Lab ▪ Videos: o Programs selected from The World of Chemistry series o Programs selected from the Chem Study series.