Science
Chemistry: Honors
Unit 3: Chemical Periodicity

Essential Understandings	▪ When one considers the arrangement of elements on the periodic table, it becomes apparent that there is a periodic repetition of chemical properties among its members. These properties have as their basis the different atomic structures of each of the elements. These properties allow us to predict various potential chemical behaviors.
Essential Questions	▪ How does the arrangement of electrons correlate with position on the periodic table and chemical properties? ▪ How do we know the relative positions of electrons for any given element?
Essential Knowledge	▪ The periodic table can be used to predict the chemical properties, atomic structure, and potential bonding behavior for any element.
Vocabulary	▪ <u>Terms</u>: o amplitude, atomic emission spectrum, atomic orbital, Aufbau principle, de Broglie's equation, electromagnetic radiation, electron configuration, energy level, frequency, ground state, Heisenberg uncertainty principle, hertz, Hund's rule, Pauli exclusion principle, photoelectric effect, photon, Planck's constant, quantum, quantum mechanical model, spectrum, wavelength, alkali metal, alkaline earth metal, covalent atomic radius, electron affinity, electronegativity, halogen, ionization energy, noble gas period, periodic law, coordination number, electron dot structure, halide ion, ionic bond, metallic bond, octet rule, valence electron, antibonding orbital, bond dissociation energy, bonding orbital, coordinate covalent bond, dipole, dipole interaction, dispersion force, double covalent bond, hybridization, hydrogen bond, molecular orbital, network solid, nonpolar covalent bond, paramagnetic, pi bond, polar bond, polar covalent bond, polar molecule, resonance, sigma bond, single covalent bond, structural formula, tetrahedral angle, triple covalent bond, unshared pair of electrons, van der Waals force, VSEPR theory.
Essential Skills	▪ Use the periodic table of the elements to predict any element's atomic structure, chemical properties and potential chemical behavior.

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Related Maine Learning Results	C4.History and nature of Science Students describe the human dimensions and traditions of science, the nature of scientific knowledge, and historical episodes in science that impacted science and society. a. Describe and provide examples of the ethical traditions in science including peer review, truthful reporting, and making results public. b. Select and describe one of the major episodes in the history of science including how the scientific knowledge changed over time and any important effects on science and society. c. Give examples that show how societal, cultural, and personal beliefs and ways of viewing the worlds can bias scientists. d. Provide examples of criteria that distinguish scientific explanations from pseudoscientific ones.

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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.
Sample Lessons And Activities	▪ Laboratory Exercise: Borax Beads ▪ Laboratory Exercise: Model Building ▪ Laboratory Exercise: Covalent Molecules

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Sample Classroom Assessment Methods	▪ Quizzes ▪ Oral reports ▪ Research projects ▪ Quizzes ▪ 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.