Science
Geophysical Science
Unit 8: Chemical Bonding

Essential Understandings	▪ Causation: Nothing "just happens". Everything is caused. ▪ Interrelatedness: Everything in the universe is connected to everything else in the universe. ▪ Dynamism: Everything is changing in some way all the time. ▪ Entropy: Change has direction. Generally, simple precedes complex. Generally, order changes toward disorder. ▪ Uniformitarianism: The way the universe works today is the way it worked yesterday and the way it will work tomorrow.
Essential Questions	▪ How do atoms combine? ▪ Under what circumstances do atoms combine? ▪ How is the Law of Conservation of Mass demonstrated when atoms combine? ▪ What determines the polarity of molecules? ▪ How are molecules different from ionic compounds?
Essential Knowledge	▪ Covalent bonds are formed by sharing electrons. ▪ Ionic bonds are formed by transferring electrons. ▪ Compounds are formed with outer shell electrons. ▪ Atoms combine in whole number ratios. ▪ Molecular symmetry determines polarity.
Vocabulary	▪ <u>Terms</u>: o chemical bonding, ionic bond, covalent bond, ion, polar and nonpolar molecule, oxidation number/state, molecules, compound
Essential Skills	▪ Writing chemical formulae with correct subscripts. ▪ Predicting how atoms will combine using the Periodic Table. ▪ Demonstrating the Law of Conservation of Matter by writing chemical formulae and balancing chemical equations. ▪ Describing how molecules and ionic compounds differ.
Related Maine Learning Results	<u>Science and Technology</u> A. Unifying Themes A2.Models Students evaluate the effectiveness of a model by comparing its predications to actual observations from the physical setting, the living environment, and the technological world.

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Related Maine Learning Results	B. The Skills and Traits of Scientific Inquiry and Technological Design B1.The Skills and Traits of Scientific Inquiry Students methodically plan, conduct, analyze data from, and communicate results of in-depth scientific investigations, including experiments guided by a testable hypothesis. a. Identify questions, concepts, and testable hypotheses that guide scientific investigations. b. Design and safely conduct methodical scientific investigations, including experiments with controls. c. Use statistics to summarize, describe, analyze, and interpret results. d. Formulate and revise scientific investigations using logic and evidence. e. Use a variety of tools and technologies to improve investigations and communications. f. Recognize and analyze alternative explanations and models using scientific criteria. g. Communicate and defend scientific ideas.

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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	▪ Lecture ▪ Chemical reactions demonstration ▪ Solubility laboratory exercise ▪ Writing chemical formulae ▪ Balancing chemical equations ▪ Copper extraction laboratory

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Sample Classroom Assessment Methods	▪ Quizzes ▪ Chapter tests ▪ Laboratory experiments and reports ▪ Formative classroom assessments
Sample Resources	▪ Publications: o Glencoe Physical Science o MARVEL Data bases* o GALE Resource Data bases** ▪ Videos: o Connections Series o The World of Chemistry