Science
Honors Geophysical Science
Unit 5: Nature of Matter

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	▪ What is matter? ▪ What is the kinetic theory of matter? ▪ What are the macroscopic characteristics of each state of matter? ▪ What are the microscopic characteristics of each state of matter? ▪ What constitutes a physical property and physical change?
Essential Knowledge	▪ All matter is made of moving particles. ▪ All matter exists in one of the four states but can change state based on the gain or loss of energy. ▪ Scientific laws and principles govern how matter responds to changes of density, pressure, and temperature.
Vocabulary	▪ <u>Terms</u>: ○ matter, solid, liquid, gas, plasma, crystals, specific heat, heat of fusion, heat of vaporization, thermal expansion
Essential Skills	▪ Calculate the relationships among temperature, pressure and volume. ▪ Use the relationship among force, area, and pressure. ▪ Distinguish among solid, liquid, gas and plasma. ▪ Calculate the thermal energy necessary to change water from a solid to a vapor.
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. 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.

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	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. 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. D4.Force and Motion Students understand that the laws of force and motion are the same across the universe. a. Describe the contribution of Newton to our understanding of force and motion, and give examples of and apply Newton's three laws of motion and his theory of gravitation. b. Explain and apply the ideas of relative motion and frame of reference. c. Describe the relationship between electric and magnetic fields and forces, and give examples of how this relationship is used in modern technologies.

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Related Maine Learning Results	d. Describe and apply characteristics of waves, including wavelength, frequency, and amplitude. e. Describe and apply an understanding of how waves interact with other waves and with materials including reflection, refraction, and absorption. f. Describe kinetic energy (the energy of motion), potential energy (dependent on relative position), and energy contained by a field (including electromagnetic waves) and apply these understandings to energy problems.
Sample Lessons And Activities	▪ Lecture ▪ "Boiling is a Cooling Process Lab" ▪ Heat of fusion and heat of vaporization demonstration ▪ 1, 4 - dichlorobenzene Lab ▪ Soda Can Combined Gas Law demonstration
Sample Classroom Assessment Methods	▪ Matter Quizzes ▪ Chapter Tests ▪ Laboratory Reports ▪ Portfolio Project (science content and literacy)
Sample Resources	▪ Publications: o Glencoe Physical Science o MARVEL Data bases* o GALE Resource Data bases** ▪ Audiovisual: o Multiple online interactive sites o Video: Connections Series o Video: The World of Chemistry