Introductory Physical Science & Force, Motion, and Energy
Correlation with the New Hampshire Grade 10 Science Curriculum Frameworks

Curriculum Strand	Curriculum Standard	Proficiency Standard	IPS Ch. 1	IPS Ch. 2	IPS Ch. 3	IPS Ch. 4	IPS Ch. 5	IPS Ch. 6	IPS Ch. 7	IPS Ch. 8	IPS Ch. 9	IPS Ch. 10	IPS Ch. 11	IPS Ch. 12	FM&E Ch. 1	FM&E Ch. 2	FM&E Ch. 3	FM&E Ch. 4	FM&E Ch. 5	FM&E Ch. 6	FM&E Ch. 7
Science as Inquiry	**1a. Curriculum Standard: Students will demonstrate an increasing understanding of how the scientific enterprise operates.**	**End of Grade Ten (Secondary) Students will be able to:** •Formulate questions and use appropriate concepts to guide scientific investigations and to solve real world problems	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Use ratios as a means of comparing very large/very small numbers, e.g. building scale models	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Design and conduct a controlled scientific investigation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Use technologies as tools in conducting investigations, e.g. microscopes, computer, calculator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Construct and revise scientific explanations and models using logic and evidence	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Recognize and analyze alternative explanations and models for observed phenomena	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Select, communicate, and defend a scientific argument	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Compare and contrast how technology has shaped our lives both in the past and the present	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Select a science-related social problem and design a solution that reflects an understanding of basic science concepts and their application																			

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		•Demonstrate an understanding that science knowledge has, over time, accumulated most rapidly after acceptance of major new theories							X												
		•Explain how scientific knowledge is applied in the design and manufacture of products or technological processes, e.g. water purification systems, sewage treatment systems, microwave ovens, resistors							X												
Science, Technology, and Society	**2a. Curriculum Standard: Students will demonstrate an increasing ability to use measuring instruments to gather accurate and/or precise information.**	**End of Grade Ten (Secondary) Students will be able to:** •Measure with both analog and digital electronic devices, e.g. voltmeter, oscilloscope, and pH meters	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Estimate the error in measurements they make and use procedures to minimize those errors	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Describe ways in which technology has improved measuring instruments and their accuracy																			
	2b. Curriculum Standard: Students will demonstrate an increasing ability to use technology to observe nature.	**End of Grade Ten (Secondary) Students will be able to:** •Explore nature with technology, e.g. microscopes, telescopes, computer probes, and spectroscopes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Gather information that can only be obtained by using a technological tool, e.g. pH, voltage, amperage, blood pressure, etc.									X	X	X	X			X	X	X	X	X
	2c. Curriculum Standard: Students will demonstrate an increasing ability to analyze, synthesize, and communicate scientific information using technology.	**End of Grade Ten (Secondary) Students will be able to:** •Store data in an appropriate technological device																			
		•Manipulate data on a database, e.g. rearranging, sorting, selecting, using a spread sheet																			
		•Analyze data graphically with technological assistance, e.g. graphing calculator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		•Communicate data through an electronic medium, e.g. camera, tape recorder, computer modem	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Quantitatively analyze experimental data	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	2d. Curriculum Standard: Students will demonstrate an increasing ability to understand how technology is used to synthesize new products.	**End of Grade Ten (Secondary) Students will be able to:** •Plan and conduct a scientific research project using technology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Construct scientific models using common materials or standard laboratory equipment		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Create a model by locating and utilizing appropriate software programs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	2e. Curriculum Standard: Students will demonstrate an increasing ability to understand that science and technology can affect individuals, and that individuals in turn can affect science and technology.	**End of Grade Ten (Secondary) Students will be able to:** •Describe immediate and long-term consequences of various alternative solutions for science- and/or technology-related issues , e.g. natural catastrophes, interactions of populations, resources and environment, health and disease				X			X												
		•Defend a personal decision made on a science- and/or technology-related issue							X												
		•Determine how technology affects their lives and predict how it might affect their future							X												
	2f. Curriculum Standard: Students will demonstrate an increasing ability to understand that progress in science and technology is controlled by societal attitudes and beliefs.	**End of Grade Ten (Secondary) Students will be able to:** •Illustrate, through example, that the knowledge produced through science and technology changes the way members of society think				X			X												

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		•Demonstrate, by giving examples, the relationships between the maintenance and progress of society and scientific and technological advancement							X												
Physical Science	**5a. Curriculum Standard: Students will demonstrate an increasing ability to distinguish among materials by utilizing observable properties.**	**End of Grade Ten (Secondary) Students will be able to:** •Obtain reliable and valid quantitative data through careful and skilled use of measuring instruments, e.g. balances, graduated cylinders, computer probes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Distinguish between qualitative and quantitative properties based upon observations of a substance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Experiment to determine specific properties of substances that are useful in identification of the substance such as density, acidity, corrosiveness, strength, stretchability, melting point, or solubility	X	X	X	X	X														
		•Use derived measurements of objects or substances to determine non-observable properties, e.g. density	X	X	X	X	X														
		•Describe, compare, and classify elements, compounds, and mixtures					X	X													
	5b. Curriculum Standard: Students will demonstrate an increasing ability to understand that matter is composed of dynamic interactive units or particles and that all the properties and changes in matter can be explained in terms of the forces involved in the interactions of these units.	End of Grade Ten (Secondary) **Students will be able to:** •Explain that the arrangement, configuration and/or motion of atoms, molecules, and ions of a particular substance determine the structure and, thus, the properties of that substance								X	X	X	X	X							
		•Recognize that groups of elements have similar properties because of their atomic structure and have been organized in a Periodic Table																			
		•Identify and describe each state of matter, including plasma, in terms of the arrangement and motion of its particulate units																			

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		•Demonstrate that it takes time for substances to change or interact and that these rates are affected by such factors as temperature, pressure, and change of state, e.g. fermentation, decomposition, combustion		X	X	X															
	5c. Curriculum Standard: Students will demonstrate an increasing ability to understand the relationships among different types and forms of energy.	**End of Grade Ten (Secondary) Students will be able to:** •Collect observations to show that transformations of energy involve the production of heat																		X	
		•Describe or sketch how energy is released when the nuclei of some atoms undergo fission or fusion																			
		•Experimentally perform the transformation of one energy form to another, e.g. by building a simple electric motor																			
		•Explain quantitatively exchanges of energy within a system, e.g. hot metal in cold water																		X	
		•Investigate and explain the range of energy released in different transformations , e.g. change of state, chemical reactions, and nuclear phenomena																			X
		•Use basic measurement to study increases and decreases in an energy system to determine conservation of energy																			X
		•Describe momentum and conduct an experiment to illustrate conservation of momentum																			
	5d. Curriculum Standard: Students will demonstrate an increasing understanding of how electrical and magnetic systems interact with matter and energy.	**End of Grade Ten (Secondary) Students will be able to:** •Investigate and measure the responses of different materials to electrical forces																			
		•Construct a simple series, parallel or compound circuit																			

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		•Measure all circuit values in a compound circuit																			
		•Demonstrate the relationship between electrical and magnetic fields of force																			
	5e. Curriculum Standard: Students will demonstrate an increasing understanding of how an unbalanced force exerted on an object causes a change in the state of rest or motion of that object in the direction of the unbalanced force.	**End of Grade Ten (Secondary) Students will be able to:** •Formulate questions, design an exploration, and collect data about objects in motion															X	X			
		•Demonstrate inertia as a property of an object which resists a change in motion and is directly related to its mass																			
		•Observe, describe, and identify basic properties of waves (transverse and longitudinal)																	X		
		•Demonstrate the relationships among change in motion, applied force, and mass of an object													X	X	X	X			
		•Identify friction as a force opposing motion													X						
		•Identify and experimentally explore forces acting at a distance (gravity/electromagnetism)													X		X				
	5f. Curriculum Standard: Students will demonstrate an increasing understanding that energy can be transmitted by waves, using light and sound as examples.	**End of Grade Ten (Secondary) Students will be able to:** •Distinguish among amplitude, wavelength, and frequency of longitudinal and transverse waves																	X		
		•Conduct investigations to demonstrate the properties of reflection, refraction and diffraction of light																			
		•Demonstrate the differences in sound quality produced by simple musical instruments, e.g. whistle, vibrating string, tapping water glasses																	X		
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		•Identify and distinguish among the various forms of electromagnet radiation, e.g. visible light, microwaves, X-rays																			
		•Determine the speed of a wave using wave length and frequency																	X		
	5g. Curriculum Standard: Students will demonstrate an increasing understanding that heat is the product of many natural processes.	**End of Grade Ten (Secondary) Students will be able to:** •Formulate a series of explorations that distinguish between heat and temperature																		X	
		•Examine the relationship between the effects of heating and cooling and the motion of the molecules of the substance being heated or cooled																		X	
		•Sketch an experiment to show how most natural processes result in an increase in entropy of the system																			
Unifying Themes and Concepts	**6a. Curriculum Standard: Students will demonstrate an increasing ability to recognize parts of any object or system, and understand how the parts interrelate in the operation of that object or system.**	**End of Grade Ten (Secondary) Students will be able to:** •Demonstrate and describe how parts of a system influence each other, including feedback																			
		•Demonstrate how systems include processes as well as parts, e.g. human body, telephone system, solar system																			
		•Show how one system can be part of another system, and how systems influence each other																			
		•Predict how certain changes in the system will/will not affect the operation of the system																			
	6b. Curriculum Standard: Students will demonstrate their understanding of the meaning of stability and change and will be able to identify and explain change in terms of cause and effect.	**End of Grade 10 (Secondary) Students will be able to:** •Distinguish among cyclic (e.g. seasons), linear (e.g.distance/time) and irregular (e.g.weather) changes and give examples of each	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		•Identify and describe varying rates of change and measure selected rates																X			
		•Recognize one form of stability as opposing changes occurring at the same rate (dynamic equilibrium) and cite several examples of that type of stability, e.g. homeostasis, saturated solutions, vapor pressure of liquids																			
		•Quantify certain changes and use a mathematical expression to determine past or future states of the system, e.g. gas laws, Newton's laws of motion													X		X				
	6c. Curriculum Standard: Students will understand the meaning of models, their appropriate use and limitations, and how models can help them in understanding the natural world.	**End of Grade Ten (Secondary) Students will be able to:** •Distinguish among physical (e.g. DNA), mathematical (e.g. D=RT), and conceptual (e.g. atom) models and give examples of each																			
		•Use different models to represent the same object or process																			
		•Use a computer and mathematical model to determine values of variables beyond the range of phenomena observed in the laboratory																			
		•Compare and explain differences in values obtained using a mathematical model and those obtained in the laboratory																			
		•Illustrate how models allow scientists to better understand the natural world																			
	6d. Curriculum Standard: Students will increasingly quantify their interactions with phenomena in the natural world, use these results to understand differences of scale in objects and systems, and determine how changes in scale affect various properties of those objects and systems.	**End of Grade 10 (Secondary) Students will be able to:** •Calculate from direct measurements, many of the derived measurements of objects such as density, velocity, inner and surface areas, volumes, perimeters, and changes in heat content	X	X	X	X									X		X	X		X	

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		•Calculate averages and ranges of measurement values for certain properties or processes in a system	X	X	X	X	X	X			X	X	X	X	X					X	X
		•Correlate the mathematical relationships among length, area, volume, surface area, mass, etc.			X										X						
		•Convert data collected from measurements into graphs and derive mathematical relationships from the data and graphs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Determine the degree of error in any measurement given the accuracy of the instruments used	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		•Express relationships among measurements in the form of a ratio, proportion, or percentage when appropriate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X