Introductory Physical Science and *Force, Motion, and Energy* Correlations with Tennessee State Board of Education Standards, Learning Experiences and Draft Performance Indicators

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Introductory Physical Science & Force, Motion and Energy **Correlation with**
Tennessee State Board of Education
Standards, Learning Expectations and Draft Performance Indicators
Seventh and Eighth Grade Physical Science Benchmarks

Standard	Learning Expectation/ Performance Indicators	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
Standard Number: 12.0 Structure and Properties of Matter The student will investigate the characteristic properties of matter.	**Learning Expectations:** 12.1 Distinguish among elements, compounds, and mixtures.					X	X													
	12.2 Identify and measure the simple properties of common substances.		X	X	X				X	X	X	X	X							
	12.3 Understand that the periodic table is used as a tool for grouping elements.																			
	Performance Indicators: *As documented through state assessment,* *at Level 1, the student is able to* 7.12.spi.1 determine the measurable properties of matter using appropriate metric units.		X	X	X					X		X								
	at Level 2, the student is able to 7.12.spi.2 recognize the different properties of elements, compounds, and mixtures.			X	X	X	X		X	X	X	X								
	7.12.spi.3 identify observable and measurable properties of solids, liquids, and gases.			X	X															
	at Level 3, the student is able to 7.12.spi.4 classify substances as elements or compounds from their chemical equations or formulas.											X								

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Standard Number: 11.0 Forces and Motion The student will investigate the effects of force on the movement of objects.	**Learning Expectation:** 11.1 Distinguish between speed and velocity.															X	X			
	11.2 Demonstrate an understanding of Newton's three laws of motion.													X		X				
	11.3 Identify factors that influence gravitational force between objects.																			
	11.4 Identify simple machines and their uses.															X				
	Performance Indicators: *As documented through state assessment,* *at Level 1, the student is able to:* 8.11.spi.1 recognize that forces cause changes in speed and/or the direction of motion.															X				
	8.11.spi.2 identify simple machines.															X				
	at Level 2, the student is able to: 8.11.spi.3 recognize the relationship between mass and the amount of force needed to move an object.																			
	8.11.spi.4 identify the relationship between the mass of objects and the amount of gravitational attraction.													X						
	8.11.spi.5 choose the most appropriate simple machine to use for a specific task.																			
	at Level 3, the student is able to: 8.11.spi.6 relate inertia, momentum and action-reaction forces to Newton's three laws of motion.													X		X				

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	8.11.spi.7 solve problems pertaining to distance, speed, velocity, and time, given illustrations, diagrams, graphs, or scenarios.																X			
Standard Number: 13.0 Interactions of Matter The student will investigate the interactions of matter.	**Learning Expectation:** 13.1 Understand the differences between acids and bases and how indicators are used.																			
	13.2 Differentiate between physical and chemical changes.		X	X	X	X	X													
	13.3 Understand what a chemical equation represents.											X								
	Performance Indicators: *As documented through state assessment*, *at Level 1, the student is able to:* 8.13.spi.1 distinguish between physical and chemical changes.		X	X	X	X	X					X								
	at Level 2, the student is able to 8.13.spi.2 identify a substance as an acid or a base, given its pH.																			
	8.13.spi.3 recognize that the mass of the reactants is the same as the mass of the products, given simple chemical equations.		X																	
	8.13.spi.5 classify a reaction is exothermic or endothermic.																			

Tennessee State Board of Education
Standards, Learning Expectations and Draft Performance Indicators
Alignment with Introductory Physical Science & Force, Motion and Energy
Grade 9-12 **Benchmarks PHYSICAL SCIENCE**

Course Description:

Physical Science is a course that explores the relationship between matter and energy. The student will investigate the following:

- Force and Motion
- Structure and Properties of Matter
- Interactions of Matter
- Energy

It is the expectation that students will experience the content of Physical Science through inquiry learning. Hands-on laboratory investigations, individual studies, and group activities should constitute a major portion of the learning experience. Using available technology, students will investigate forces and motion, the chemical and physical properties of matter, the ways in which matter and energy interact within the natural world, and the forms and properties of energy. Conservation of matter and energy is an underlying theme throughout the course. Physical Science will provide the knowledge, prerequisite skills, and habits of mind needed for problem solving and ethical decision making about matters of scientific and technological concern. Physical science provides a basic foundation for advanced studies in chemistry and physics.

Standard	**Learning Expectation**	**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**
<u>Standard 1.0 - Force and Motion</u> Standard: The student will explore the concepts of force and motion.	The student will: 1.1 investigate the relationship between speed, velocity, and acceleration.																			
	1.2 analyze and apply Newton's three laws of motion.													**X**		**X**				
	1.3 relate gravitational force to mass and distance.																			
	1.4 demonstrate the relationship between work, power, and machines.																			
	1.5 examine the law of conservation of momentum in everyday situations.																			

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Standard 1.0 - Force and Motion Standard: The student will explore the concepts of force and motion.	**Performance Indicators State:** *As documented through state assessment*, *at Level 1, the student is able to:* * distinguish between speed and velocity, given a scenario.																			
	* relate inertia, force, or action-reaction forces to Newton's three laws of motion given an illustration or a diagram.																			
	* distinguish between mass and weight, given examples using SI units.		**X**												**X**					
	* identify simple machines, given illustrations.															**X**				
	At Level 2, the student is able to: * interpret distance-time graphs for velocity or velocity-time graphs for acceleration.																**X**			
	* calculate velocity, given distance and time; acceleration, given velocity and time; force, given mass and acceleration; work, given force and distance; or power, given work and time, using the provided formulas.																**X**			
	*distinguish among the three laws of motion, given a scenario.													**X**		**X**				
	* choose the correct illustration that relates the effects of gravity on the motion of falling bodies, tides or satellites.																			

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Standard 1.0 - Force and Motion Standard: The student will explore the concepts of force and motion.	* choose the correct scenario that illustrates the law of conservation of momentum.																			
Standard 2.0 - Structure and Properties of Matter Standard: The student will examine the structure, properties, and classifications of matter.	The student will: 2.1 classify and identify matter as a pure substance or a mixture.					X	X													
	2.2 explore matter in terms of specific properties.		X	X	X	X	X	X												
	Performance Indicators State: *As documented through state assessment,* *at Level 1, the student is able to:* * select a pure substance, which is an element or a compound, from a list of choices.						X													
	* identify a substance as a compound or mixture, given a description of the substance.					X	X													
	* distinguish between the volume, shape and particle arrangement in the four phases of matter (solid, liquid, gas, and plasma).								X											
	* distinguish among elements, compounds, solutions, colloids, and suspensions, given an example.					X	X													
	At Level 2, the student is able to: * identify an element as a metal, nonmetal or metalloid using the periodic table.																			

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Standard 2.0 - Structure and Properties of Matter Standard: The student will examine the structure, properties, and classifications of matter.	* recognize the symbols for common elements (H, He, Li, …) or formulas for common compounds (i.e. H2O, NaCl, CO2, HCl, Fe2O3, C6H12O6, NaOH), given a list.																			
	* calculate density, given mass and volume.			X																
	* predict the behavior of an object when placed in water, given its density.																			
	At Level 3, the student is able to: * identify the atomic number, atomic mass, number of protons, number of neutrons, and number of electrons in an atom of a given element, using the periodic table.																			
	* determine the effects of pressure, temperature, or volume (related to Charles' and Boyle's law) on the behavior of gases, given a diagram																			
Standard: 3.0 - Interactions of Matter Standard: The student will investigate the interactions of matter.	The student will: 3.1 investigate chemical and physical changes.					X	X	X												
	3.2 analyze chemical equations.											X								
	3.3 compare and contrast acids and bases.																			
	3.4 explore the laws of conservation of mass.		X																	

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Standard: 3.0 - Interactions of Matter Standard: The student will investigate the interactions of matter.	* identify the reactants and products in a chemical reaction, given a chemical equation.																			
	* identify a substance as acidic, basic, or neutral, given its pH.																			
	At Level 2, the student is able to: * select the reaction that is endothermic or exothermic, given the temperature change during the reaction.																			
	* identify a chemical reaction as either synthesis, decomposition, single-replacement or double-replacement reactions, given examples.																			
	* predict the effect of acid rain on people or the environment, given a scenario.				**X**															
	* demonstrate the law of conservation of mass in a chemical reaction by selecting the balanced equation.											**X**								
	At Level 3, the student is able to: * select the correct coefficients to balance a given chemical equation.																			
	* predict the products given the reactants of a chemical reaction.																			
Standard: 4.0 - Energy Standard: The student will compare and contrast various forms of energy.	The student will: 4.1 investigate the properties and behaviors of waves.																	X		
	4.2 explore and explain the nature of sound and light energy.																			
	4.3 examine the applications and effects of heat energy.																		**X**	

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Standard: 4.0 - Energy Standard: The student will compare and contrast various forms of energy.	4.4 probe the fundamental principles and applications of electrical energy.										X	X	X							
	4.5 distinguish between nuclear fission and nuclear fusion.																			
	4.6 investigate the law of conservation of energy.																			X
	Performance Indicators State: *As documented through state assessment,* *at Level 1, the student is able to:* * classify waves as transverse or longitudinal, given an illustration.																	X		
	* identify wavelength, frequency and amplitude, given an illustration.																	X		
	* determine the temperature scale, given the boiling and/or freezing point of water.																		X	
	At Level 2, the student is able to: * identify a wave interaction as reflection, diffraction, refraction, and interference, given an example.																			
	* select characteristics that best describe sound or light energy.																	X		
	* determine whether the transfer of thermal energy is conduction, convection or radiation, given an illustration.																			
	* compare and contrast the four kinds of wave interactions *(reflection, diffraction, refraction, and interference)*.																			
	* calculate voltage, given resistance and current in a series circuit, given the formulas.																			

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Standard: 4.0 - Energy Standard: The student will compare and contrast various forms of energy.	*at Level 3, the student is able to:* * calculate the amount of heat gained or lost by a substance during a chemical reaction, given the formula.																			
	* demonstrate how compressions and rarefactions of a sound wave change when they travel through different media.																			
	* differentiate between music and noise in terms of sound waves.																			
	* collect data, construct and interpret graphs pertaining to the frequency and wavelength of different sounds.																			
	* identify the medical and industrial uses of ultrasound.																			
	* create an activity that demonstrates the conservation of heat energy.																			
	* construct a schematic of a simple electrical circuit.										X	X	X							
	* design an experiment to verify Ohm's law.																			
	* compare the types of energy and their impact on science and society.																			
	At Level 3, the student is able to: * research the economies of various commercial heat sources, defending views about why they are or are not practical choices of energy.																			
	* analyze a series electrical circuit to show that the sum of the individual voltage drops across circuit resistors equals the total voltage source.																			

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Standard: 4.0 - Energy Standard: The student will compare and contrast various forms of energy.	* research and debate the relationship between current energy situations and the possibility of future energy crises.																			