Introductory Physical Science & Force, Motion, and Energy – Correlation with the Pennsylvania Grade 10 Physical Science Content Standards

Domain	Content Standard	Benchmark	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
Unifying Themes Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to	A. Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.	Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch).		C		<u> </u>						- T		<u> </u>		0.1.2					
		Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems.																			
		Explain the concept of system redesign and apply it to improve technological systems.																			
		Apply the universal systems model to illustrate specific solutions and troubleshoot specific problems.																			
		Analyze and describe the effectiveness of systems to solve specific problems.																			
		Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA).																			
		Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability).																			
		Apply mathematical models to science and technology.																			

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	C. Apply patterns as repeated processes or recurring elements in science and technology.	Examine and describe recurring patterns that form the basis of biological classification, chemical periodicity, geological order and astronomical order.																			
		Examine and describe stationary physical patterns.																			
		Examine and describe physical patterns in motion																			
	D. Apply scale as a way of Relating concepts and ideas to one another by some measure.	Apply dimensional analysis and scale as a ratio.																			
		Convert one scale to another.																			
	E. Describe patterns of change in nature, physical and man made systems.	Describe how fundamental science and technology concepts are used to solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, gas laws, feedback systems).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Recognize that stable systems often involve underlying dynamic changes (e.g., a chemical reaction at equilibrium has molecules reforming continuously).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Describe the effects of error in measurements.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Describe changes to matter caused by heat, cold, light or chemicals using a rate function.		X	X	X														X	

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Inquiry and Design Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to	A. Apply knowledge and understanding about the nature of scientific and technological knowledge.	Compare and contrast scientific theories and beliefs.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Know that science uses both direct and indirect observation means to study the world and the universe.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Integrate new information into existing theories and explain implied results.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	B. Apply process knowledge and organize scientific and technological phenomena in varied ways.	Describe materials using precise quantitative and qualitative skills based on observations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Use process skills to make inferences and predictions using collected information and to communicate, using space / time relationships, defining operationally.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	C. Apply the elements of scientific inquiry to solve problems.	Generate questions about objects, organisms and/or events that can be answered through scientific investigations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Evaluate the appropriateness of questions.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		Design an investigation with adequate control and limited variables to investigate a question.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Conduct a multiple step experiment.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Organize experimental information using a variety of analytic methods.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Judge the significance of experimental information in answering the question.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Suggest additional steps that might be done experimentally.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	D. Identify and apply the technological design process to solve problems.	Examine the problem, rank all necessary information and all questions that must be answered.																			
		Propose and analyze a solution.																			
		Implement the solution.																			
		Evaluate the solution, test, redesign and improve as necessary.																			
		Communicate the process and evaluate and present the impacts of the solution.																			
3.4 Physical Science, Chemistry and Physics Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to	A. Explain concepts about the structure and properties of matter.	Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable.																			
		Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table.																			

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		Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations.																	
		Describe phases of matter according to the Kinetic Molecular Theory.																	
		Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).																	
		Recognize formulas for simple inorganic compounds.																	
		Describe various types of chemical reactions by applying the laws of conservation of mass and energy.		X															
		Apply knowledge of mixtures to appropriate separation techniques.				X													
		Understand that carbon can form several types of compounds.																	
	B. Analyze energy sources and transfers of heat.	Determine the efficiency of chemical systems by applying mathematical formulas.																	
		Use knowledge of chemical reactions to generate an electrical current.																	
		Evaluate energy changes in chemical reactions.																	
		Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion).																	X

Domain	Content Standard	Benchmark	IPS	IPS IPS	IPS	IPS	IPS	IPS	IPS	IPS	IPS	IPS	IPS	FM&E	FM&E	FM&E	FM&E	FM&E	FM&E	FM&E
			Ch. 1	IPS IPS Ch. 3	Ch. 4	Ch. 5	Ch. 6	Ch. 7	Ch. 8	Ch. 9	Ch. 10	Ch. 11	Ch. 12	Ch. 1	Ch. 2	Ch. 3	Ch. 4	Ch. 5	Ch. 6	Ch. 7
		Explain resistance, current and																		1 !
		electro-motive force (Ohm's																		
		Law).																		
																				1 !
	C. Distinguish among the	Identify elements of simple																		
	principles of force and motion.	machines in compound machines.												X		X				
	1 1	_																		
		Identify the relationship of																		
		electricity and magnetism as two																		1
		aspects of a single electromagnetic	С																	İ
		force.																		1
		Explain fluid power systems																		
		through the design and construction	or																	1
		of appropriate models.																		İ
		D 1 1 00 + (<u> </u>
		Describe sound effects (e.g.,																		İ
		Doppler effect, amplitude, frequency, reflection, refraction,																X		ĺ
		absorption, sonar, seismic).																Λ		ĺ
		absorption, sonar, seisinie).																		1 !
		Describe light effects (e.g.,																		
		Doppler effect, dispersion,																		İ
		absorption, emission spectra,																		ĺ
		polarization, interference).																		1
		Describe and measure the motion	0																	
		sound, light and other objects.															X	X		İ
		Know Newton's laws of motion																		
		(including inertia, action and																		ĺ
		reaction) and gravity and apply												X		X				ĺ
		them to solve problems related to forces and mass.																		İ
		Torces and mass.																		1
		Determine the efficiency of																		ĺ
		mechanical systems by applying																		i
		mathematical formulas.																		1
	R Evoluin assential ideas shout	Compare the basic structures of				-			1											
	B. Explain essential ideas about the composition and structure of	the universe (e.g., galaxy types,																		i '
	the universe.	nova, black holes, neutron stars).																		i '
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		Describe the structure and life																		
		cycle of star, using the																		ĺ
		Hertzsprung-Russell diagram.																		i '
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		Describe the nuclear processes involved in energy production in a star.	CII, I	CH. 2	CII. S	CII, 4	CII, 3	CII. U	CII, 7	CII. U	CII. 7	Сп. 10	Сп. 11	CII, 12	CII, I	CII, Z	CII. U	CII. 4	CII. S	CII. U	CII, 7
		Explain the "red-shift" and Hubble's use of it to determine stellar distance and movement.																			
		Compare absolute versus apparent star magnitude and their relation to stellar distance.																			
		Explain the impact of the Copernican and Newtonian thinking on man's view of the universe.																			
		Identify and analyze the findings of several space instruments in regard to the extent and composition of the solar system and universe.																			
3.7 Technical Devices Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to	and techniques to solve problems and answer questions.	Select and safely apply appropriate tools, materials and processes necessary to solve complex problems.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Apply advanced tool and equipment manipulation techniques to solve problems.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	B. Apply appropriate instruments and apparatus to examine a variety of objects and processes.	Describe and use appropriate instruments to gather and analyze data.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Explain the need to estimate measurements within error of various instruments.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		Apply accurate measurement knowledge to solve everyday problems.	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
		Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines).																			
	C. Apply basic computer operations and concepts.	Identify solutions to basic hardware and software problems.																			
		Apply knowledge of advanced input devices.																			
		Apply knowledge of hardware setup.																			
		Describe the process for basic software installation and demonstrate it.																			
		Analyze and solve basic operating systems problems.																			
		Apply touch keyboarding skills and techniques at expectable speed and accuracy.																			
		Demonstrate the ability to perform basic software installation.																			
	D. Utilize computer software to solve specific problems.	Identify legal restrictions in the use of software and the output of data.																			
		Apply advanced graphic manipulation and desktop publishing techniques.																			
		Apply basic multimedia applications.																			
		Apply advanced word processing, database and spreadsheet skills.																			

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		Describe and demonstrate how two or more software applications can be used to produce an output.																			
		Select and apply software designed to meet specific needs.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	E. Apply basic computer communications systems.	Identify and explain various types of on-line services.																			
		Identify and explain the function of the parts of a basic network.																			
		Describe and apply the components of a web page and their function.																			
		Explain and demonstrate file transfer within and out side of a computer network.																			
		Identify, describe and complete advanced on-line research.																	X		
3.8 Science, Technology, and Human Endeavors Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to	scientific and technological enterprises.	Identify past and current tradeoffs between increased production, environmental harm and social values (e.g., increased energy needs, power plants, automobiles).				X			X												
		Compare technologies that are applied and accepted differently in various cultures (e.g., factory farming, nuclear power).							X												
		Describe and evaluate social change as a result of technological developments.							X												
		Assess the social impacts of a specific international environmental problem by designing a solution that applies the appropriate technologies and resources.							X												

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	B. Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.	Identify several problems and opportunities that exist in your community, apply various problem-solving methods to design and evaluate possible solutions.				X													
		Analyze a recently invented item, describing the human need that prompted its invention and the current and potential social impacts of the specific invention.							X										
		Apply knowledge of oceanography, meteorology, geology and human anatomy to explain important considerations that need to be made for construction of homes, buildings and businesses in the United States.																	
		Assess the impacts that agricultural science has had on meeting human needs and improving the quality of life.																	
	C. Evaluate possibilities consequences and impacts of scientific and technological solutions.	Relate scientific and technological advancements in terms of cause and effect.																	
		Describe and evaluate the impacts that financial considerations have had on specific scientific and technological applications.																	
		Compare and contrast potential solutions to technological, social, economic and environmental problems.																	
		Analyze the impacts on society of accepting or rejecting scientific and technological advances.																	