Introductory Physical Science & Force, Motion, and Energy Correlation to Arizona Academic Standards & Accountability Science Standards

Domain	Content Standard	Performance Benchmark	IPS Ch 1	IPS Ch. 2	IPS Ch. 3	IPS Ch. 4	IPS Ch5	IPS Ch6	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 1: Science As Inquiry Students understand and use the processes of scientific investigation and scientific ways of knowing. They are able to design, conduct, describe and evaluate these investigations. They are able to understand and apply concepts that unify scientific disciplines.	ESSENTIALS (Grades 4-8) Students know and are able to do all of the above and the following: * 1SC-E1. Identify a question, formulate a hypothesis, control and manipulate variables, devise experiments, predict outcomes, compare and analyze results, and defend conclusions	PO 1. Design an experiment using a scientific method	x	X	X	x	x	x	x	X	X	x	X	X	X	x	x	X	X	X	X
		PO 2. Conduct an experiment using a scientific method	X	Х	Х	X	Х	X	X	Х	Х	X	Х	X	Х	Х	Х	Х	Х	Х	X
		PO 3. Analyze the results of an experiment	X	X	X	X	X	X	X	X	X	Х	X	X	X	X	X	X	X	X	X
		PO 4. Defend conclusions drawn from the analysis	X	Х	X	X	X	X	X	X	X	X	X	X	X	X	X	Х	Х	X	X
	* 1SC-E2. Create a model (e.g., a computer simulation, a stream table) to predict change	PO 1. Construct a model that demonstrates change within a system		х																	
		PO 2. Describe variables that cause change		Х																	
		PO 3. Explain cause and effect of variables within a system		X																	
	* 1SC-E3. Organize and present data gathered from their own experiences, using appropriate mathematical analyses and graphical representations	PO 1. Construct a representation of data (e.g., histogram, stem-and-leaf plot, scatter plot, circle graph, flow chart)	x	X	X	X	X	X	X	X	X	X	X	X	X	X	x	X	X	X	X
		PO 2. Interpret patterns in collected data	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Х	Х
	* 1SC-E4. Identify and refine questions from previous investigations	PO 1. Analyze the results of previous investigations	X	Х	X	X	X	X	X	Х	X	X	X	X	Х	X	X	Х	X	X	X
		PO 2. Refine hypotheses from a previous investigation	X	Х	X	X	X	X	X	Х	X	X	Х	X	Х	X	X	Х	Х	X	X
	* 1SC-E5. Analyze the processes, parts and subsystems of a bicycle, a clock or other mechanical or electrical device	PO 1. Explain the interaction among parts within mechanical or electrical devices																			
		PO 2. Analyze the processes that operate within a mechanical or electrical device																			

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	PROFICIENCY - (Grades 9-12) Students know and are able to do all of the above and the following:	PO 1. Evaluate scientific information for relevance to a given problem																			
	* 1SC-P1. Propose solutions to practical and theoretical problems by synthesizing and evaluating information gained from scientific investigations		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		PO 2. Propose solutions to a problem, based on information gained from scientific investigations	X	Х	X	х	X	Х	x	x	х	X	X	X	Х	х	х	X	X	X	x
		PO 1. Assess the capability of a model to represent a "real world" scenario																			
	* 1SC-P3. Analyze and evaluate reports of scientific studies	PO 1. Analyze reports of scientific studies for elements of experimental design																			
		PO 2. Compare conclusions to original hypotheses																			
		PO 3. Evaluate validity of conclusions																			
	* 1SC-P4. Create and defend a written plan of action for a scientific investigation	PO 1. Design an appropriate protocol (written plan of action) for the investigation of a scientific problem	х	х	X	х	X	X	X	Х	х	х	X	X	х	х	Х	X	X	X	Х
		PO 2. Justify the protocol in terms of the elements of experimental design	X	X	X	X	X	X	Х	X	X	X	X	X	X	X	X	X	X	X	X
	* 1SC-P5. Apply the concepts of equilibrium, form and function to a variety of phenomena	PO 1. Predict the effects of various factors on the equilibrium of a system																			
		PO 2. Explain how the relationships between form and function are evident in natural and designed systems																			
		PO 3. Describe how present form and function of an object, organism or system could have evolved from prior form and function																			
	* 1SC-P6. Identify and refine a researchable question, conduct the experiment, collect and analyze data, share and discuss findings	PO 1. Construct a researchable question					X														
		PO 2. Employ a research design that incorporates a scientific method to carry out an experiment					X														
		PO 3. Analyze experimental data					X														

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Standard 2: History and Nature of Science	ESSENTIALS (Grades 4-8) Students know and are able to do all of the above and the following:	PO 1. Describe the effects of major scientific events on society																			
Students understand the nature of scientific ways of thinking. Students understand that scientific investigation grows from the contributions of many people.	* 2SC-E1. Identify major milestones in science that have revolutionized the thinking of the time					X			X												
		PO 2. Describe a recent scientific event that has impacted the quality of life				X			X												
	* 2SC-E2. Describe how science and technology are interrelated	PO 1. Describe a technological discovery that influences science							X												
		PO 2. Describe a scientific discovery that influences technology							X												
		PO 3. Determine scientific processes involved in a technological advancement							X												
		PO 1. Analyze different theories to explain a phenomenon																			
		PO 2. Defend or refute the explanation of a phenomenon																			
	* 2SC-E4. Identify characteristics of scientific ways of thinking	PO 1. Describe the following scientific processes: observing, communicating, comparing, organizing, relating, inferring and applying	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		PO 1. Describe the relationship between theory and hypotheses																			
		PO 2. Describe how experimental procedures can be formulated to test a hypothesis																			
		PO 3. Explain how experimental results may affect a hypothesis and a theory																			
	* 2SC-E6. Demonstrate how Science is an ongoing process of gathering and evaluating information, assessing evidence for and against theories and hypotheses, looking for patterns, and then devising and testing possible explanations.	PO 1. Compare and contrast the evidence of a hypothesis																			
		PO 2. Compare and contrast the evidence of a theory																			

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		PO 4. Analyze a theory																			
	PROFICIENCY (Grades 9-12) Students know and are able to do all of the above and the following: * 2SC-P1. Identify and describe key factors (e.g., technology, competitiveness, world events, personalities, societal views) that affect the development and acceptance of scientific thought																				
		PO 2. Describe how different key factors affect the development and acceptance of scientific thought																			
	* 2SC-P2. Explain how scientific innovations can challenge accepted ideas	PO 1. Describe how an accepted idea could be challenged by scientific innovation																			
	society of major scientific developments (e.g., germ theory,	PO 1. Describe the benefits, limitations, and consequences of major scientific developments in pure and applied science																			
		PO 2. Explain how major scientific developments in pure and applied science have affected, or could affect, society				x			X										X		
	* 2SC-P4. Trace the development and consequences of an invention, theory or discovery to demonstrate the dynamic nature of science	PO 1. Trace the development of a selected invention, theory or discovery from its inception to modern day																			
		PO 2. Explain the progression of changes in the invention, theory or discovery																			
		PO 3. Describe the impact of the invention, theory or discovery on further scientific thought				х			X										X		
	* 2SC-P5. Explain how theory, law, and fact are developed in science to answer a specific question.	PO 1. Define theory, law and fact																			
		PO 2. Describe the relationships among theories, laws and facts																			
		PO 3. Explain how theories, laws and facts are used to answer specific questions																			

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Standard 3: Personal and Social Perspectives in Science And Technology Students understand the impact of science on human activity and the environment and are proficient in the uses of technology as they relate to science.	Students know and are able to do all of the above and the following:	PO 1. Explain how scientific knowledge, thinking processes and skills are used to solve problems in a variety of careers																			
	* 3SC-E2. Develop and use a systematic approach to analyze the risks associated with natural and biological hazards	PO 1. Analyze the risk factors associated with natural and biological hazards																			
	propose a solution or product that	PO 1. Design a solution or product that addresses a need and considers the factors of an environmental or human problem																			
	* 3SC-E4. Implement a proposed solution or design and evaluate its merit	PO 1. Apply a proposed solution to a problem																			
		PO 2. Evaluate the merit of a proposed solution																			
	Students know and are able to do all of the above and the following:	PO 1. Apply scientific thought processes of skepticism, empiricism, objectivity and logic to seek a solution to personal and social issues				X			x										X		
		PO 2. Apply a scientific method to the solution of personal and social issues																			
	*3SC-P2. Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	PO 1. Describe a problem or need					x														
		PO 2. Propose a solution to the problem or design a product to meet the need					X														
		PO 3. Design a method of testing the solution or design a model or simulation to test the product					X														
		PO 4. Carry out the test of the solution or product					X														
		PO 5. Evaluate the test results					X														

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		PO 2. Compare the goals of science and the goals of technology																			
		PO 3. Describe the impact of technology on the life, physical, earth and space sciences				X			X										Х		
	* 3SC-P4. Identify and describe the basic processes of the natural ecosystems and how these processes affect, and are affected by, humans	PO 1. Describe the basic processes of the natural ecosystems (e.g., water cycle, nutrient cycles)																			
		PO 2. Explain how these processes affect, and are affected by, humans																			
	* 3SC-P5. Describe and explain factors that affect population size and growth (e.g., birth and death rates, quality of environment, disease, education)	PO 1. Describe biotic and abiotic factors that affect populations																			
		PO 2. Predict the effect of a change in a specific factor on a population																			
Standard 5 : Physical Science Students understand the nature of matter and energy including their forms, the changes they undergo and their interactions.	ESSENTIALS (Grades 4-8) Students know and are able to do all of the above and the following: * 5SC-E1. Examine, describe, compare, measure, and classify objects and mixtures of substances based on common physical and chemical properties (e.g., states of matter, mass, volume, electrical charge, density, boiling points, pH, magnetism, solubility)	PO 1. Classify objects and mixtures of substances based on physical and chemical properties			X																
		PO 2. Analyze physical and chemical properties of objects and mixtures			X	X	X	X													
	in terms of elements, compounds,	PO 1. Classify matter in terms of elements, compounds, mixtures, atoms and molecules					X	Х		X	X		X	X							
		PO 2. Describe elements, compounds, mixtures, atoms and molecules as they relate to matter					X	X		X	X		X	X							
		PO 1. Define the law of conservation of energy																			X
		PO 2. Describe how energy is a property of a substance																		X	X
		PO 3. Explain ways in which energy is transferred																	X	X	X

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		PO 2. Predict the outcome when matter experiences an external force or energy change																	X	X	X
	* 5SC-E5. Describe, measure and calculate characteristics (e.g., speed, distance, mass, force, gravity) of moving objects and their interactions (e.g., force, velocity, acceleration, potential energy, and kinetic energy) within a system	PO 1. Analyze moving objects within a system using Newton's laws of motion													x		X				
	Students know and are able to do all	PO 1. Describe physical and chemical properties that are used to characterize substances																			
	* 5SC-P1. Predict chemical and physical properties of substances (e.g., color, solubility, chemical reactivity, melting point, boiling point)			X	X			X													
		PO 2. Determine physical and chemical properties of a substance through observation, measurement and experimentation		X	X	x	X	x													
		PO 3. Separate mixtures of substances based on their physical and chemical properties					X														
	properties and composition of samples	PO 1. Use models of atomic and molecular structure to explain properties of matter								x	x		X	X							
		PO 2. Use the periodic table to predict properties of elements and compounds																			
		PO 3. Predict the properties of substances based upon ionic, covalent, or hydrogen bonding												X							
		PO 1. Identify qualitative and quantitative relationships associated with energy (e.g., heat, mechanical, electrical)																	x	x	x
		PO 2. Measure quantitative (e.g., heat, mechanical, electrical) relationships associated with energy																	х	х	X

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	* 5SC-P4. Observe, measure and calculate quantities to demonstrate conservation of matter and energy in chemical changes (e.g., acid base, precipitation, heat)	PO 1. Use the law of conservation of matter to explain the quantitative relationships between reactants and products in chemical reactions		X	X	X	X	X													
		PO 2. Quantify the mass relationships between reactants and products in chemical reactions		X	X	X	X	X													
		PO 3. Use the law of conservation of energy to explain the energy changes in chemical reactions																			X
		PO 4. Quantify the energy changes in chemical reactions																		X	X
	* 5SC-P5. Describe and predict chemical reactions (including combustion and simple chemical reactions) and physical interaction of matter (including velocity, force, work and power), using words or symbolic equations	PO 1. Express a chemical reaction by using a balanced equation																			
		PO 2. Predict the products of a chemical reaction using types of reactions (e.g., synthesis, decomposition, replacement, combustion)																			
		PO 3. Describe physical interactions through use of word equations or formulae																			
		PO 4. Predict the results of a physical interaction by using an algebraic formula																			
	* 5SC-P6. Describe and explain physical interactions of matter and energy, using conceptual models (e.g., particle model for gaseous behavior)	PO 1. Demonstrate the use of conceptual models in science (e.g., formulae, diagrams, graphs)	x	x	x	X	X	x	x	x	x	x	x	x	х	x	X	x	X	X	X
		PO 2. Describe physical interactions of matter and energy (e.g., phasechange, gas laws, momentum conservation)																			X
		PO 3. Justify the validity of known conceptual models applied to physical phenomena																			
	* 5SC-P7. Demonstrate the understanding of gravitation as a universal force that each mass exerts on any other mass	PO 1. Use the universal law of gravitation to predict how the gravity force changes with a change of distance and/or mass																			

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	PO 2. Describe a sequence of that illustrates the 2nd Law of Thermodynamics																			