Introductory Physical Science and Force, Motion, and Energy – Correlation with the New Jersey Physical Science Curriculum Framework

Standard	Purpose/Learning Expectation	Performance Indicators	IPS Ch. 1		IPS Ch. 3			IPS Ch. 6	IPS Ch. 7		IPS Ch. 9	IPS Ch. 10	IPS Ch. 11						FM&E Ch. 5		
systems of interacting components and understand how their interactions	The purpose of this standard is to have students identify systems— those that exist in nature and those that are designed and built by humans—and to be able to understand the interactive relationships between the parts and the whole.		X	X	X	x	X	x	X	X	X	X	X	X	X	X	X	X	X	X	X
Science Standard 2 All students will develop problem-solving, decision- making, and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.	A paramount goal of any science program would be the envelopment of those skills used by scientists as they conduct investigations and share the results of those investigations with others.		X	X	X	x	x	x	X	X	X	X	X	X	X	X	X	X	X	X	X
Science Standard 3 All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.	 To show students that scientific ideas and theories have a history of their own by tracing the evolution of our most important present-day paradigms To fully integrate the impact of scientific and technological advances—and the people who made them—in each student's understanding of history To present science as an ongoing human activity, contributed to by people of all cultures, subject to inherent limitations, and influenced by the social and political climates of the time 		X	X	X	X	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Standard	Purpose/Learning Expectation	Performance Indicators	IPS Ch. 1		IPS Ch. 3				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 Standard 4 All students will develop an understanding of technology as an application of scientific principles.	The purpose of this standard is to have students appreciate the intimate relationship between science and technology and (more importantly) to combine hands-on technology and design skills with the learning of scientific principles.																				
Science Standard 5 All students will integrate mathematics as a tool for problem solving in science, and as a means of expressing and/or modeling scientific theories.	Science cannot be practiced, taught, or learned without the usefulness of mathematics as a language and an essential problem-solving tool.		X	x	x	x	x	X	x	X	x	X	X	X	X	X	X	X	X	X	X
All students will gain an understanding of the structure and behavior of matter.	By the middle grades, students will realize that many objects are, in fact, combinations of different substances. The notion of how small pieces of matter join together as mixtures or compounds can be used to introduce the concept of forming new substances with new properties. The idea of chemical vs. physical change—an elusive concept at this age—can be introduced but will not be fully understood. Likewise, any discussion of atoms, elements, and molecules should not be expected to lead to a complete understanding of atomic structure.	skills gained in the preceding grades, by the end of Grade 8, students			X	X	X	X	X	X	X	X	X	X							
		5. Show how substances can react with each other to form new substances having characteristic properties different from those of the original substances.		x	x	x	X	x													
		6. Know that all matter is made up of atoms that may join together to form molecules, and that the state of matter is determined by the arrangement and motion of the atoms or molecules.								x	x										

Standard	Purpose/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. ⁹	IPS Ch.	IPS 9 Ch. 10	IPS Ch. 11	IPS Ch 12	FM&E	FM&E Ch. 2	FM&E	FM&E	FM&E	FM&E Ch. 6	FM&E Ch. 7
<u>Science Standard 8</u> All students will gain an understanding of the structure and behavior of matter.	By the middle grades, students will realize that many objects are, in fact, combinations of different substances. The notion of how small pieces of matter join together as mixtures or compounds can be used to introduce the concept of forming new substances with new properties. The idea of chemical vs. physical change—an elusive concept at this age—can be introduced but will not be fully understood. Likewise, any discussion of atoms, elements, and molecules should not be expected to lead to a complete understanding of atomic structure.	7. Explain how atoms are rearranged when substances react, but that the total number of atoms and the total mass of the newly formed substances remains the same as that of the original substances.		<u>X</u>		<u>CII. 4</u>	<u>UII. 3</u>		<u>Cn.</u> /		X	X	X	<u>UII. 12</u>			<u> </u>	<u>UII. 4</u>			<u><u> </u></u>
		8. Explain that over 100 different atoms, corresponding to over 100 different elements, have been identified and can be grouped according to their similar properties.																			
		 Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students 9. Know that atoms consist of a nucleus surrounded by electrons, and that the arrangement of the electrons determines the chemical behavior of each element. 																			
		10. Know that the nucleus consists of protons and neutrons, and that each atom of a given element has the same number of protons but that the number of neutrons may vary.																			
		11. Explain how atoms can form bonds to other atoms by transferring or sharing electrons.												X							
		12. Demonstrate different types of chemical reactions and the various factors affecting reaction rates.		X	x	x	X	X													

Standard	Purpose/Learning Expectation	Performance Indicators	IPS IPS	IPS IPS Ch. 3 Ch. 4	IPS Ch. 5	IPS Charles	IPS	IPS IPS	IPS Ch. 10	IPS Ch 11	IPS Ch 12	FM&E	FM&E	FM&E	FM&E	FM&E	FM&E	FM&E
<u>Science Standard 8</u> All students will gain an understanding of the structure and behavior of matter.	By the middle grades, students will realize that many objects are, in fact, combinations of different substances. The notion of how small pieces of matter join together as mixtures or compounds can be used to introduce the concept of forming new substances with new properties. The idea of chemical vs. physical change—an elusive concept at this age—can be introduced but will not be fully understood. Likewise, any discussion of atoms, elements, and molecules should not be expected to lead to a complete understanding of atomic structure.	of Elements evolved and how it relates atomic structure to the physical and chemical properties			<u>Cn. 5</u>		<u>. n. /</u>	<u>Un. 8 Un. 9</u>	<u>Cn. 10</u>		<u>Un. 12</u>		<u>Cn. 2</u>	<u>Cn. 3</u>	<u>Un. 4</u>	<u>Cn. 5</u>	<u>Cn. 6</u>	<u>Cn.</u> 7
<u>Science Standard 9:</u> All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.	This standard forms the basis for an investigation of force and motion leading to an understanding of energy and energy transformation.	 Building upon knowledge and skills gained in the preceding grades, by the end of Grade 8, students 8. Explain how a moving object that is not being subjected to a net force will move in a straight line at a steady speed. 												x				
		 9. Show that when more than one force acts on an object at the same time, the forces can reinforce or cancel each other, producing a net force that will change the speed or direction of the object. 10. Investigate how the force of 												X				
		friction acts to retard motion. 11. Describe the various forms of energy, including heat, light, sound, chemical, nuclear, mechanical, and electrical energy and that energy can be transformed from one form to another.					X					X		X			X	X
		12. Explain how heat flows through materials or across space from warmer objects to cooler ones until both objects are at the same temperature.															X	

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		13. Explain that the sun is a major source of the Earth's energy and that energy is emitted in various forms, including visible light, infrared and ultraviolet radiation.																		
		14. Show how light is reflected, refracted, or absorbed when it interacts with matter and how colors appear as a result of this interaction.																		
Science Standard 9: All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.	This standard forms the basis for an investigation of force and motion leading to an understanding of energy and energy transformation.	15. Show how vibrations in materials can generate waves, which can transfer energy from one place to another.																X		
		Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students 16. Explain the mathematical relationship between the mass of an object, the unbalanced force exerted on it, and the resulting acceleration.														X				
		17. Prove that whenever one object exerts a force on another, an equal amount of force is exerted back on the first object.												X		X				
		18. Know that gravity is a universal force of attraction between masses that depends on the masses and the distance between them.																		X
		19. Know that electrically charged bodies can attract or repel each other with a force that depends on the size and nature of the charges and the distance between them.																		
		20. Explain the similarities and differences between gravitational forces and electrical forces that act at a distance.												X						X

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Science Standard 9: All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.	This standard forms the basis for an investigation of force and motion leading to an understanding of energy and energy transformation.	21. Know that the forces that hold the nucleus of an atom together are stronger than electromagnetic forces and that significant amounts of energy are released during nuclear changes.		<u>Ch. 2</u>	<u>Ch. 3</u>	<u>Ch. 4</u>	<u>Ch. 5</u>	<u>Ch. 6</u>	<u>Ch. 7</u>	<u>Ch. 8</u>	<u>Ch. 9</u>	Ch. 10	<u>Ch. 11</u>	<u>Ch. 12</u>	<u>Ch. 1</u>	<u>Ch. 2</u>	Ch. 3	Ch. 4	Ch. 5	<u>Ch. 6</u>	Ch. 7
		22. Explain how electromagnetic waves are generated, and identify the components of the electromagnetic spectrum.																			
		23. Explain that all energy is either kinetic or potential and that the total energy of the universe is constant.																			X