Introductory Physical Science & Force, Motion, and Energy - Correlation to California Dept of Education - Grade Eight Science Content Standards

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Motion	1. The velocity of an object is the rate of change of its position. As a basis for under-standing this concept:	a. Students know position is defined in relation to some choice of a standard reference point and a set of reference directions.																X			
		b. Students know that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.																X			
		c. Students know how to solve problems involving distance, time, and average speed.																X			
		d. Students know the velocity of an object must be described by specifying both the direction and the speed of the object.																X			
		e. Students know changes in velocity may be due to changes in speed, direction, or both.																X			
		f. Students know how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.																X			
Forces	2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:	a. Students know a force has both direction and magnitude.													X	X	X				
		b. Students know when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.														X	X				
		c. Students know when the forces on an object are balanced, the motion of the object does not change.														X	X				
		d. Students know how to identify separately the two or more forces that are acting onæ a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.													X	X	X				

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Forces	2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:	e. Students know that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).															X				
		f. Students know the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.																			
		g. Students know the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.																			
Structure of Matter	3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:	a. Students know the structure of the atom and know it is composed of protons, neutrons, and electrons.											X	X							
		b. Students know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.						X		X			X								
		c. Students know atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.								X											
		d. Students know the states of matter (solid, liquid, gas) depend on molecular motion.								X											
		e. Students know that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.								X											
		f. Students know how to use the periodic table to identify elements in simple compounds.											X								

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Earth in the Solar System (Earth Science)	4. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept:	a. Students know galaxies are clusters of billions of stars and may have different shapes.																			
		b. Students know that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.																			
		c. Students know how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.																			
		d. Students know that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.																			
		e. Students know the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.																			
Reactions	5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:	a. Students know reactant atoms and molecules interact to form products with different chemical properties.						X		X			X								
		b. Students know the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.		X						X											
		c. Students know chemical reactions usually liberate heat or absorb heat.		X		X		X												X	
		d. Students know physical processes include freezing and boiling, in which a material changes form with no chemical reaction.		X	X															X	X
		e. Students know how to determine whether a solution is acidic, basic, or neutral.																			

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Chemistry of Living Systems (Life Science)	6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:	a. Students know that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.																			
		b. Students know that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.																			
		c. Students know that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.																			
Periodic Table	7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:	a. Students know how to identify regions corresponding to metals, nonmetals, and inert gases.																			
		b. Students know each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.																			
		c. Students know substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.			X	X	X		X	X											
Density and Buoyancy	8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:	a. Students know density is mass per unit volume.			X	X	X														
		b. Students know how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.			X		X														
		c. Students know the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.														X					
		d. Students know how to predict whether an object will float or sink.														X					

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Investigation and Experimentation	9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:	a. Plan and conduct a scientific investigation to test a hypothesis.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Evaluate the accuracy and reproducibility of data.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		c. Distinguish between variable and controlled parameters in a test.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		d. Recognize the slope of the linear graph as the constant in the relationship y = kx and apply this principle in interpreting graphs constructed from data.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		g. Distinguish between linear and nonlinear relationships on a graph of data.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X