Physical Science

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
SC.912.P.8	Matter		
SC.912.P.8.A	A working definition of matter is that it takes up space, has mass, and has measurable properties. Matter is comprised of atomic, subatomic, and elementary particles.	Elements, Compounds and Mixtures	Compounds
SC.912.P.8.B	Electrons are key to defining chemical and some physical properties, reactivity, and molecular structures. Repeating (periodic) patterns of physical and chemical properties occur among elements that define groups of elements with similar properties. The periodic table displays the repeating patterns, which are related to the atom's outermost electrons. Atoms bond with each other to form compounds.	Elements, Compounds and Mixtures	Compounds Patterns on the Periodic Table Tutorial: It's All About the Electrons
SC.912.P.8.C	In a chemical reaction, one or more reactants are transformed into one or more new products. Many factors shape the nature of products and the rates of reaction.	Elements, Compounds and Mixtures	Compounds
SC.912.P.8.D	Carbon-based compounds are building-blocks of known life forms on earth and numerous useful natural and synthetic products.	Elements, Compounds and Mixtures	Organic Compounds
SC.912.P.8.1	Differentiate among the four states of matter.	Matter, Energy and Change	The States of Matter
SC.912.P.8.2	Differentiate between physical and chemical properties and physical and chemical changes of matter.	Matter, Energy and Change	The States of Matter
SC.912.P.8.3	Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.	Elements, Compounds and Mixtures	Atomic Theory Unit Portfolio Project, Part 1: The Development of Atomic Theory
SC.912.P.8.4	Explore the scientific theory of atoms (also known as atomic	Elements, Compounds and Mixtures	The Nuclear Atom

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	theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.		
SC.912.P.8.5	Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.	Elements, Compounds and Mixtures	Patterns on the Periodic Table Tutorial: It's All About the Electrons
SC.912.P.8.6	Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.	Elements, Compounds and Mixtures	The Nuclear Atom
SC.912.P.8.7	Interpret formula representations of molecules and compounds in terms of composition and structure.	Elements, Compounds and Mixtures	The Nuclear Atom
SC.912.P.8.8	Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.	Elements, Compounds and Mixtures	The Nuclear Atom
SC.912.P.8.9	Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.	Elements, Compounds and Mixtures	The Nuclear Atom
SC.912.P.8.10	Describe oxidation-reduction reactions in living and non-living systems.	Elements, Compounds and Mixtures	The Nuclear Atom

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SC.912.P.8.11	Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.	Elements, Compounds and Mixtures	Acids and Bases
SC.912.P.8.12	Describe the properties of the carbon atom that make the diversity of carbon compounds possible.	Elements, Compounds and Mixtures	The Nuclear Atom
SC.912.P.8.13	Identify selected functional groups and relate how they contribute to properties of carbon compounds.	Elements, Compounds and Mixtures	The Nuclear Atom
SC.912.P.10	Energy		
SC.912.P.10.A	Energy is involved in all physical and chemical processes. It is conserved, and can be transformed from one form to another and into work. At the atomic and nuclear levels energy is not continuous but exists in discrete amounts. Energy and mass are related through Einstein's equation $E=mc^2$.	Chemical Reactions	Nuclear Reactions: Fusion Nuclear Reactions: Fission Nuclear Reactions: Radioactive Decay
SC.912.P.10.B	The properties of atomic nuclei are responsible for energy-related phenomena such as radioactivity, fission and fusion.	Chemical Reactions	Nuclear Reactions: Fusion Nuclear Reactions: Fission Nuclear Reactions: Radioactive Decay
SC.912.P.10.C	Changes in entropy and energy that accompany chemical reactions influence reaction paths. Chemical reactions result in the release or absorption of energy.	Chemical Reactions	Nuclear Reactions: Fusion Nuclear Reactions: Fission Nuclear Reactions: Radioactive Decay

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SC.912.P.10.D	The theory of electromagnetism explains that electricity and magnetism are closely related. Electric charges are the source of electric fields. Moving charges generate magnetic fields.	Electricity and Magnetism	Electric Potential Magnets and Electromagnets
SC.912.P.10.E	Waves are the propagation of a disturbance. They transport energy and momentum but do not transport matter.	Waves	Amplitude and Energy
SC.912.P.10.1	Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.	Matter, Energy and Change	Forms of Energy Energy Transformations
SC.912.P.10.2	Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.	Matter, Energy and Change	Forms of Energy Energy Transformations
SC.912.P.10.3	Compare and contrast work and power qualitatively and quantitatively.	Machines	Work Power
SC.912.P.10.4	Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.	Matter, Energy and Change	Kinetic Theory of Matter Heat Transfer
SC.912.P.10.5	Relate temperature to the average molecular kinetic energy.	Matter, Energy and Change	Kinetic Theory of Matter
SC.912.P.10.6	Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.	Matter, Energy and Change	Kinetic Theory of Matter

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SC.912.P.10.7	Distinguish between endothermic and exothermic chemical processes.	Chemical Reactions	Energy Gains and Losses Lab and Discussion: Endothermic and Exothermic Reactions
SC.912.P.10.8	Explain entropy's role in determining the efficiency of processes that convert energy to work.	Chemical Reactions	Energy Gains and Losses
SC.912.P.10.9	Describe the quantization of energy at the atomic level.	Chemical Reactions	Lab and Discussion: Endothermic and Exothermic Reactions
SC.912.P.10.10	Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).	Chemical Reactions	Energy Gains and Losses
SC.912.P.10.11	Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.	Chemical Reactions	Nuclear Reactions: Fusion Nuclear Reactions: Fission Nuclear Reactions: Radioactive Decay Advantages and Disadvantages of Nuclear Power
SC.912.P.10.12	Differentiate between chemical and nuclear reactions.	Chemical Reactions	Nuclear Reactions: Fusion
SC.912.P.10.13	Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.	Electricity and Magnetism	Electricity Electric Current and Circuits
SC.912.P.10.14	Differentiate among conductors, semiconductors, and insulators.	Electricity and Magnetism	Electricity Electric Current and Circuits

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SC.912.P.10.15	Investigate and explain the relationships among current, voltage, resistance, and power.	Electricity and Magnetism	Electricity Electric Current and Circuits
SC.912.P.10.16	Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.	Electricity and Magnetism	Magnets and Electromagnets Electromagnetic Induction
SC.912.P.10.17	Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.	Electricity and Magnetism	Magnets and Electromagnets Electromagnetic Induction
SC.912.P.10.18	Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.	Electricity and Magnetism	Magnets and Electromagnets Electromagnetic Induction
SC.912.P.10.19	Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.	Electricity and Magnetism	Magnets and Electromagnets Electromagnetic Induction
SC.912.P.10.20	Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.	Waves	The Doppler Effect
SC.912.P.10.21	Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.	Waves	The Doppler Effect
SC.912.P.10.22	Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.	Waves	The Doppler Effect

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SC.912.P.12	Motion		
SC.912.P.12.A	Motion can be measured and described qualitatively and quantitatively. Net forces create a change in motion. When objects travel at speeds comparable to the speed of light, Einstein's special theory of relativity applies.	Energy in Motion	Gravity
SC.912.P.12.B	Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.	Energy in Motion	Gravity
SC.912.P.12.C	The Law of Universal Gravitation states that gravitational forces act on all objects irrespective of their size and position.	Energy in Motion	Gravity
SC.912.P.12.D	Gases consist of great numbers of molecules moving in all directions. The behavior of gases can be modeled by the kinetic molecular theory.	Matter, Energy and Change	Kinetic Theory of Matter
SC.912.P.12.E	Chemical reaction rates change with conditions under which they occur. Chemical equilibrium is a dynamic state in which forward and reverse processes occur at the same rates.	Matter, Energy and Change	Kinetic Theory of Matter
SC.912.P.12.1	Distinguish between scalar and vector quantities and assess which should be used to describe an event.	Matter, Energy and Change	Kinetic Theory of Matter
SC.912.P.12.2	Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.	Energy in Motion	Velocity Acceleration

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SC.912.P.12.3	Interpret and apply Newton's three laws of motion.	Energy in Motion	Newton's Laws of Motion Journal: The Laws of Motion
SC.912.P.12.4	Describe how the gravitational force between two objects depends on their masses and the distance between them.	Energy in Motion	Newton's Universal Law of Gravitation
SC.912.P.12.5	Apply the law of conservation of linear momentum to interactions, such as collisions between objects.	Energy in Motion	Newton's Universal Law of Gravitation
SC.912.P.12.6	Qualitatively apply the concept of angular momentum.	Energy in Motion	Newton's Universal Law of Gravitation
SC.912.P.12.7	Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.	Energy in Motion	Newton's Universal Law of Gravitation
SC.912.P.12.8	Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.	Energy in Motion	Newton's Universal Law of Gravitation
SC.912.P.12.9	Recognize that time, length, and energy depend on the frame of reference.	Energy in Motion	Newton's Universal Law of Gravitation
SC.912.P.12.10	Interpret the behavior of ideal gases in terms of kinetic molecular theory.	Energy in Motion	Newton's Universal Law of Gravitation

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SC.912.P.12.11	Describe phase transitions in terms of kinetic molecular theory.	Matter, Energy and Change	Changes in State
SC.912.P.12.12	Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.	Matter, Energy and Change	Changes in State
SC.912.P.12.13	Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.	Matter, Energy and Change	Changes in State