

Chemistry

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.	Chemistry All Around	Section A
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.	Atomic Theory Periodic Table	Sections B, C, and D Sections A and B
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.	Chemical Reactions	Section C
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 Form Compounds	Section E
SC.912.P.8.1	Differentiate among the four states of matter.	Chemistry All Around	Section B
SC.912.P.8.2	Differentiate between physical and chemical properties and physical and chemical changes of matter.	Chemistry All Around	Sections B and C
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.	Atomic Theory	Section A
SC.912.P.8.4	Explore the scientific theory of atoms (also known as atomic	Atomic Theory	Section B

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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.	Periodic Table	Section B
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 Form Compounds	Sections A, B and D
SC.912.P.8.7	Interpret formula representations of molecules and compounds in terms of composition and structure.	Elements Form Compounds	Sections A and B
SC.912.P.8.8	Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.	Chemical Reactions	Section C
SC.912.P.8.9	Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.	Chemical Reactions	Sections A and B
SC.912.P.8.10	Describe oxidation-reduction reactions in living and non-living systems.		

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SC.912.P.8.11	Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.	Water and Solution Chemistry	Section C
SC.912.P.8.12	Describe the properties of the carbon atom that make the diversity of carbon compounds possible.	Elements Form Compounds	Section E
SC.912.P.8.13	Identify selected functional groups and relate how they contribute to properties of carbon compounds.	Elements Form Compounds	Section E
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 Thermodynamics and Equilibrium Nuclear Chemistry	Section D Section C
SC.912.P.10.B	The properties of atomic nuclei are responsible for energy-related phenomena such as radioactivity, fission and fusion.	Nuclear Chemistry	Sections A and B
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 Thermodynamics and Equilibrium	Section C

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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.		
SC.912.P.10.E	Waves are the propagation of a disturbance. They transport energy and momentum but do not transport matter.	Atomic Structure	Section D
SC.912.P.10.1	Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.	Nuclear Chemistry	Section C
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.	Chemical Thermodynamics and Equilibrium	Section C
SC.912.P.10.3	Compare and contrast work and power qualitatively and quantitatively.		
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.	Chemical Thermodynamics and Equilibrium	Section A
SC.912.P.10.5	Relate temperature to the average molecular kinetic energy.	Chemical Thermodynamics and Equilibrium	Section A
SC.912.P.10.6	Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.		

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SC.912.P.10.7	Distinguish between endothermic and exothermic chemical processes.	Chemical Reactions	Section C
SC.912.P.10.8	Explain entropy's role in determining the efficiency of processes that convert energy to work.	Chemical Thermodynamics and Equilibrium	Section C
SC.912.P.10.9	Describe the quantization of energy at the atomic level.	Atomic Theory	Section C
SC.912.P.10.10	Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).		
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.	Nuclear Chemistry	Sections A and B
SC.912.P.10.12	Differentiate between chemical and nuclear reactions.	Nuclear Chemistry	Section A
SC.912.P.10.13	Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.		
SC.912.P.10.14	Differentiate among conductors, semiconductors, and insulators.		

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SC.912.P.10.15	Investigate and explain the relationships among current, voltage, resistance, and power.		
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.		
SC.912.P.10.17	Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.		
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.		
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.		
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.		
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.		
SC.912.P.10.22	Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.		

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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.		
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.		
SC.912.P.12.C	The Law of Universal Gravitation states that gravitational forces act on all objects irrespective of their size and position.		
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.	Solids, Liquids, and Gases	Section B
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.	Chemical Thermodynamics and Equilibrium	Section E
SC.912.P.12.1	Distinguish between scalar and vector quantities and assess which should be used to describe an event.		
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.		

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SC.912.P.12.3	Interpret and apply Newton's three 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.		
SC.912.P.12.5	Apply the law of conservation of linear momentum to interactions, such as collisions between objects.		
SC.912.P.12.6	Qualitatively apply the concept of angular momentum.		
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.		
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.		
SC.912.P.12.9	Recognize that time, length, and energy depend on the frame of reference.		
SC.912.P.12.10	Interpret the behavior of ideal gases in terms of kinetic molecular theory.	Solids, Liquids, and Gases	Section B

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SC.912.P.12.11	Describe phase transitions in terms of kinetic molecular theory.	Solids, Liquids, and Gases	Section D
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.	Chemical Reactions	Section E
SC.912.P.12.13	Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.	Chemical Thermodynamics and Equilibrium	Section E