

Physical Science CR

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
PS	Physical Science		
0	Scientific Inquiry		
PS-1	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.		
PS-1.1	Generate hypotheses on the basis of credible, accurate, and relevant sources of scientific information.	Scientific Nature	The Scientific Method
PS-1.2	Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.	Scientific Nature	The Scientific Method
PS-1.3	Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.		
PS-1.4	Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.	Scientific Nature	The Scientific Method
PS-1.5	Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.	Scientific Inquiry	Organizing Data
PS-1.6	Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.	Scientific Inquiry	Drawing Conclusions

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PS-1.7	Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).		
PS-1.8	Compare the processes of scientific investigation and technological design.	Scientific Nature Scientific Inquiry	The Scientific Method Technological Design
PS-1.9	Use appropriate safety procedures when conducting investigations.	Scientific Inquiry	Safety During Investigations
0	Chemistry: Structure and Properties of Matter		
PS-2	The student will demonstrate an understanding of the structure and properties of atoms.		
PS-2.1	Compare the subatomic particles (protons, neutrons, electrons) of an atom with regard to mass, location, and charge, and explain how these particles affect the properties of an atom (including identity, mass, volume, and reactivity).	Elements, Compounds and Mixtures	Atomic Theory
PS-2.2	Illustrate the fact that the atoms of elements exist as stable or unstable isotopes.		
PS-2.3	Explain the trends of the periodic table based on the elements' valence electrons and atomic numbers.	Elements, Compounds and Mixtures	Trends on The Periodic Table
PS-2.4	Use the atomic number and the mass number to calculate the number of protons, neutrons, and/or electrons for a given isotope of an element.	Elements, Compounds and Mixtures	Chemistry's Elemental Concepts
PS-2.5	Predict the charge that a representative element will acquire according to the arrangement of electrons in its outer energy level.	Elements, Compounds and Mixtures	It's All About the Electrons
PS-2.6	Compare fission and fusion (including the basic processes and the fact that both fission and fusion convert a fraction of the mass of interacting particles into energy and release a great amount of energy).	Chemical Reactions	Nuclear Reactions

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PS-2.7	Explain the consequences that the use of nuclear applications (including medical technologies, nuclear power plants, and nuclear weapons) can have.	Chemical Reactions	Nuclear Reactions Nuclear Waste
PS-3	The student will demonstrate an understanding of various properties and classifications of matter.		
PS-3.1	Distinguish chemical properties of matter (including reactivity) from physical properties of matter (including boiling point, freezing/melting point, density [with density calculations], solubility, viscosity, and conductivity).	Matter, Energy and Change	The Properties of Matter
PS-3.2	Infer the practical applications of organic and inorganic substances on the basis of their chemical and physical properties.		
PS-3.3	Illustrate the difference between a molecule and an atom.	Elements, Compounds and Mixtures	Chemistry's Elemental Concepts
PS-3.4	Classify matter as a pure substance (either an element or a compound) or as a mixture (either homogeneous or heterogeneous) on the basis of its structure and/or composition.	Elements, Compounds and Mixtures	Mixtures
PS-3.5	Explain the effects of temperature, particle size, and agitation on the rate at which a solid dissolves in a liquid.	Elements, Compounds and Mixtures	Solubility

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PS-3.6	Compare the properties of the four states of matter-solid, liquid, gas, and plasma-in terms of the arrangement and movement of particles.		
PS-3.7	Explain the processes of phase change in terms of temperature, heat transfer, and particle arrangement.	Matter, Energy and Change	The Kinetic Theory of Matter
PS-3.8	Classify various solutions as acids or bases according to their physical properties, chemical properties (including neutralization and reaction with metals), generalized formulas, and pH (using pH meters, or pH paper, and litmus paper).	Elements, Compounds and Mixtures	Acids and Bases
PS-4	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.		
PS-4.1	Explain the role of bonding in achieving chemical stability.	Elements, Compounds and Mixtures	It's All About the Electrons
PS-4.2	Explain how the process of covalent bonding provides chemical stability through the sharing of electrons.	Elements, Compounds and Mixtures	Covalent Bonds
PS-4.3	Illustrate the fact that ions attract ions of opposite charge from all directions and form crystal lattices.		
PS-4.4	Classify compounds as crystalline (containing ionic bonds) or molecular (containing covalent bonds) based on whether their outer electrons are transferred or shared.		
PS-4.5	Predict the ratio by which the representative elements combine to form binary ionic compounds, and represent that ratio in a chemical formula.		

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PS-4.6	Distinguish between chemical changes (including the formation of gas or reactivity with acids) and physical changes (including changes in size, shape, color, and/or phase).	Matter, Energy and Change	Physical and Chemical Changes
PS-4.7	Summarize characteristics of balanced chemical equations (including conservation of mass and changes in energy in the form of heat-that is, exothermic or endothermic reactions).	Chemical Reactions	Balancing Chemical Reactions
PS-4.8	Summarize evidence (including the evolution of gas; the formation of a precipitate; and/or changes in temperature, color, and/or odor) that a chemical reaction has occurred.		
PS-4.9	Apply a procedure to balance equations for a simple synthesis or decomposition reaction.	Chemical Reactions	Balancing Chemical Reactions
PS-4.10	Recognize simple chemical equations (including single replacement and double replacement) as being balanced or not balanced.	Chemical Reactions	Balancing Chemical Reactions
PS-4.11	Explain the effects of temperature, concentration, surface area, and the presence of a catalyst on reaction rates.		
0	Physics: The Interactions of Matter and Energy		
PS-5	The student will demonstrate an understanding of the nature of forces and motion.		
PS-5.1	Explain the relationship among distance, time, direction, and the velocity of an object.	Energy in Motion	Velocity
PS-5.2	Use the formula $v = d/t$ to solve problems related to average speed or velocity.	Energy in Motion	Velocity

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PS-5.3	Explain how changes in velocity and time affect the acceleration of an object.	Energy in Motion	Velocity Acceleration
PS-5.4	Use the formula $a = (vf-vi)/t$ to determine the acceleration of an object.	Energy in Motion	Acceleration
PS-5.5	Explain how acceleration due to gravity affects the velocity of an object as it falls.	Energy in Motion	Free Fall
PS-5.6	Represent the linear motion of objects on distance-time graphs.	Energy in Motion	Using Graphs to Represent Speed
PS-5.7	Explain the motion of objects on the basis of Newton's three laws of motion: inertia; the relationship among force, mass, and acceleration; and action and reaction forces.	Energy in Motion	Newton's Three Laws of Motion
PS-5.8	Use the formula $F = ma$ to solve problems related to force.	Energy in Motion	Newton's Three Laws of Motion
PS-5.9	Explain the relationship between mass and weight by using the formula $FW = mag$.		
PS-5.10	Explain how the gravitational force between two objects is affected by the mass of each object and the distance between them.	Energy in Motion	Gravity and Forces
PS-6	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.		
PS-6.1	Explain how the law of conservation of energy applies to the transformation of various forms of energy (including mechanical energy, electrical energy, chemical energy, light energy, sound energy, and thermal energy).	Matter, Energy and Change	The Law of Conservation of Energy
PS-6.2	Explain the factors that determine potential and kinetic energy and the transformation of one to the other.	Matter, Energy and Change	Kinetic and Potential Energy

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PS-6.3	Explain work in terms of the relationship among the force applied to an object, the displacement of the object, and the energy transferred to the object.	Machines	Work and Power
PS-6.4	Use the formula $W = Fd$ to solve problems related to work done on an object.	Machines	Work and Power
PS-6.5	Explain how objects can acquire a static electric charge through friction, induction, and conduction.	Electricity and Magnetism	Static Electricity
PS-6.6	Explain the relationships among voltage, resistance, and current in Ohm's law.	Electricity and Magnetism	Understanding Ohm's Law, Currents, and Circuits
PS-6.7	Use the formula $V = IR$ to solve problems related to electric circuits.	Electricity and Magnetism	Understanding Ohm's Law, Currents, and Circuits
PS-6.8	Represent an electric circuit by drawing a circuit diagram that includes the symbols for a resistor, switch, and voltage source.	Electricity and Magnetism	Understanding Ohm's Law, Currents, and Circuits
PS-6.9	Compare the functioning of simple series and parallel electrical circuits.	Electricity and Magnetism	Understanding Ohm's Law, Currents, and Circuits
PS-6.10	Compare alternating current (AC) and direct current (DC) in terms of the production of electricity and the direction of current flow.	Electricity and Magnetism	Understanding Ohm's Law, Currents, and Circuits
PS-6.11	Explain the relationship of magnetism to the movement of electric charges in electromagnets, simple motors, and generators.	Electricity and Magnetism	Electromagnetic Induction Energy Sources
PS-7	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.		

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PS-7.1	Illustrate ways that the energy of waves is transferred by interaction with matter (including transverse and longitudinal/compressional waves).	Waves	Categories of Waves
PS-7.2	Compare the nature and properties of transverse and longitudinal/compressional mechanical waves.	Waves	Categories of Waves
PS-7.3	Summarize characteristics of waves (including displacement, frequency, period, amplitude, wavelength, and velocity as well as the relationships among these characteristics).	Waves	Understanding Waves
PS-7.4	Use the formulas $v = f$ and $v = d/t$ to solve problems related to the velocity of waves.		
PS-7.5	Summarize the characteristics of the electromagnetic spectrum (including range of wavelengths, frequency, energy, and propagation without a medium).	Waves	The Electromagnetic Spectrum
PS-7.6	Summarize reflection and interference of both sound and light waves and the refraction and diffraction of light waves.	Waves	Reflection and Refraction of Sound Waves Wave Interference Refraction
PS-7.7	Explain the Doppler effect conceptually in terms of the frequency of the waves and the pitch of the sound.	Waves	The Doppler Effect