

# Physical Science Standards and Benchmarks

<b>Standard 1: Understands and applies principles of scientific inquiry</b>				
<i>Power Benchmarks: Identifies questions and concepts that guide science investigations Uses technology and mathematics to improve investigations and communications Formulates and revises scientific explanations and models using logic and evidence Recognizes and analyzes alternative explanations and models</i>				
<b>Course Level Benchmarks</b>	<b>Vocabulary</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Classroom Resources</b>
A. Formulates and revises scientific explanations and models	<ul style="list-style-type: none"> <li>• scientific explanation</li> <li>• scientific model</li> <li>• data</li> <li>• critical thinking</li> </ul>	<ul style="list-style-type: none"> <li>• Knows scientific explanations and models are based on data</li> <li>• Know new data may lead to the modification of scientific explanations and models</li> </ul>	<ul style="list-style-type: none"> <li>• Analyzes data with respect to scientific explanations and models (ACT, SAT, ITED, AP PHYSICS)</li> <li>• Adjusts scientific explanations and models based on data (ACT, SAT, ITED, AP PHYSICS)</li> </ul>	Physical Science Curriculum Guide  Emphasized throughout the entire curriculum
B. Understands how scientific knowledge changes with new evidence	<ul style="list-style-type: none"> <li>• scientific knowledge</li> <li>• evidence</li> <li>• law</li> <li>• theory</li> </ul>	<ul style="list-style-type: none"> <li>• Understands how scientists explore the world</li> <li>• Knows how the many different branches of science are organized</li> <li>• Understands how laws and theories are different</li> </ul>	<ul style="list-style-type: none"> <li>• Creates and explains a concept map (spider map) of branches of science</li> <li>• Compares and contrasts scientific law and theory</li> </ul>	
C. Uses technology and mathematics to perform accurate scientific investigations and communications	<ul style="list-style-type: none"> <li>• technology</li> <li>• scientific method</li> <li>• accuracy/precision</li> <li>• variable</li> <li>• spreadsheets and graphs</li> <li>• length</li> <li>• mass/weight</li> <li>• volume</li> <li>• scientific notation</li> <li>• significant figures</li> </ul>	<ul style="list-style-type: none"> <li>• Knows how technology can help scientific investigations and communications</li> <li>• Knows how measurement is used in science</li> <li>• Knows the importance of organized data in science</li> <li>• Knows how large and small amounts are handled with scientific data</li> <li>• Explains the precision of a measurement</li> </ul>	<ul style="list-style-type: none"> <li>• Uses metric conversions to change from one unit of measure to another</li> <li>• Measures the length, mass, volume, and weight of various objects with precision</li> <li>• Designs a simple experiment that can be used to test a hypothesis</li> <li>• Describes how scientific data is organized (ACT, SAT, ITED, AP PHYSICS)</li> <li>• Uses significant digits to record scientific data</li> </ul>	<u>Technology:</u> use of science to solve everyday problems

## Physical Science Standards and Benchmarks

### Standard 1: Understands and applies principles of scientific inquiry (con't)

*Power Benchmarks: Identifies questions and concepts that guide science investigations  
Uses technology and mathematics to improve investigations and communications  
Formulates and revises scientific explanations and models using logic and evidence  
Recognizes and analyzes alternative explanations and models*

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
D. Demonstrates safe handling procedures	<ul style="list-style-type: none"> <li>• OSHA</li> <li>• EPA</li> <li>• MSDS</li> <li>• Right to Know</li> <li>• hazardous</li> <li>• safety procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Knows appropriate safety procedures for a given situation</li> <li>• Knows where safety devices are located in the classroom</li> <li>• Understands the process of waste disposal</li> </ul>	<ul style="list-style-type: none"> <li>• Follows required safety procedures</li> <li>• Recognizes, reports, and corrects safety problems</li> <li>• Follows waste disposal procedures</li> </ul>	Physical Science Curriculum Guide  Emphasized throughout the entire curriculum



## Physical Science Standards and Benchmarks

<b>Standard 2: Understands and applies principles of physical science</b>				
<i>Power Benchmark: Understands and applies knowledge of conservation of energy and increase in disorder Understands and applies knowledge of interaction of energy and matter</i>				
<b>Course Level Benchmarks</b>	<b>Vocabulary</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Classroom Resources</b>
<p>B. Examines interactions of energy and matter</p> <p><b>1. Work</b></p>	<p><b>Work</b></p> <ul style="list-style-type: none"> <li>• work</li> <li>• joules</li> <li>• power</li> <li>• simple machines</li> <li>• mechanical advantage</li> <li>• energy</li> <li>• potential energy</li> <li>• kinetic energy</li> <li>• mechanical energy</li> <li>• efficiency</li> </ul>	<p><b>Work</b></p> <ul style="list-style-type: none"> <li>• Understands work is done when force causes an object to change its motion</li> <li>• Understands power is the rate that work is done</li> <li>• Understands how machines change the size and direction of forces</li> <li>• Knows the simple machines: lever, pulley, wheel and axle, inclined plane, wedge, and screw</li> <li>• Knows compound machines are made of two or more simple machines</li> <li>• Knows when work is done, energy is transformed or transferred</li> <li>• Knows potential energy results from the relative positions of objects in a system</li> <li>• Knows kinetic energy depends on both mass and speed</li> <li>• Knows energy readily changes from one form to another</li> <li>• Knows the Law of Conservation of Energy states energy can never be created nor destroyed</li> <li>• Knows a machine cannot do more work than the work required to operate it</li> </ul>	<p><b>Work</b></p> <ul style="list-style-type: none"> <li>• Makes a concept map of simple machines</li> <li>• Used math to determine the work and power output of a system</li> <li>• Calculates mechanical advantage</li> <li>• Identifies the simple machine used by common objects (i.e., drill bit, boat oar, skateboard ramp)</li> <li>• Builds a simple machine and explains how it works</li> <li>• Builds a compound machine and explains how it works</li> <li>• Calculates the kinetic and potential energy of an object</li> <li>• Shows how energy is transferred through an object (i.e., a bent piece of wire)</li> <li>• Used the Law of Conservation of Energy to explain a pendulum's motion</li> <li>• Uses the concepts of potential and kinetic energy to describe the motion of a child on a swing</li> </ul>	<p>Physical Science Curriculum Guide</p>

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### Standard 2: Understands and applies principles of physical science (con't)

*Power Benchmark: Understands and applies knowledge of conservation of energy and increase in disorder  
Understands and applies knowledge of interaction of energy and matter*

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
B. Examines interactions of energy and matter (con't) 2. Waves	<b>Waves</b> <ul style="list-style-type: none"> <li>• mechanical wave</li> <li>• sound</li> <li>• light</li> <li>• amplitude</li> <li>• medium</li> <li>• frequency</li> <li>• wave length</li> <li>• period</li> <li>• electromagnetic wave</li> <li>• transverse wave</li> <li>• longitudinal wave</li> <li>• crest</li> <li>• trough</li> </ul>	<b>Waves</b> <ul style="list-style-type: none"> <li>• Understands waves have energy and can transfer energy when they interact with matter</li> <li>• Understands the properties of waves</li> <li>• Knows wavelengths can be used to identify substances</li> <li>• Knows the speed of a wave depends on the properties of the medium</li> <li>• Knows a wave is a disturbance that carries energy through matter or space</li> <li>• Knows most waves are caused by vibrating objects</li> <li>• Knows the difference between transverse, longitudinal, and surface waves</li> <li>• Understands the different types of wave interactions</li> </ul>	<b>Waves</b> <ul style="list-style-type: none"> <li>• Gives examples of the transfer of energy through wave action</li> <li>• Identifies parts of a wave</li> <li>• Explains the relationship between frequency and wave length</li> <li>• Determines the elastic potential energy and kinetic energy of a spring</li> <li>• Calculates frequency and period of a wave</li> <li>• Calculates the speed of a wave</li> <li>• Demonstrates interference regarding wave action</li> <li>• Calculates wave action with the use of a pendulum</li> <li>• Explains the Doppler Effect</li> </ul>	Physical Science Curriculum Guide

## Physical Science Standards and Benchmarks

### Standard 2: Understands and applies principles of physical science (con't)

*Power Benchmark: Understands and applies knowledge of the structure of matter*

<b>Course Level Benchmarks</b>	<b>Vocabulary</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Classroom Resources</b>
C. Recognizes patterns in the properties of matter <b>1. Matter</b>	<b>Matter</b> <ul style="list-style-type: none"> <li>• matter</li> <li>• element</li> <li>• atom</li> <li>• molecule</li> <li>• compound</li> <li>• pure substance</li> <li>• mixture</li> <li>• melting point</li> <li>• boiling point</li> <li>• density</li> <li>• reactivity</li> <li>• physical change</li> <li>• chemical change</li> </ul>	<b>Matter</b> <ul style="list-style-type: none"> <li>• Knows matter is an element, compound, or mixture</li> <li>• Understands each element is made up of one kind of atom</li> <li>• Know compounds contain two or more elements chemically combined</li> <li>• Knows physical properties do not change the identity of a substance</li> <li>• Knows chemical properties describe how a substance changes into a new substance</li> <li>• Knows the difference between physical and chemical changes</li> </ul>	<b>Matter</b> <ul style="list-style-type: none"> <li>• Calculates the density of a substance</li> <li>• Analyzed the physical properties of various substances</li> </ul>	Physical Science Curriculum Guide

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<b>Course Level Benchmarks</b>	<b>Vocabulary</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Classroom Resources</b>
<p>C. Recognizes patterns in the properties of matter (con't)</p> <p><b>2. Phase Changes</b></p>	<p><b>Phase Changes</b></p> <ul style="list-style-type: none"> <li>• fluid</li> <li>• plasma</li> <li>• energy</li> <li>• temperature</li> <li>• thermal energy</li> <li>• evaporation</li> <li>• sublimation</li> <li>• condensation</li> <li>• pressure</li> <li>• pascal</li> <li>• buoyant force</li> <li>• viscosity</li> <li>• gas laws</li> </ul>	<p><b>Phase Changes</b></p> <ul style="list-style-type: none"> <li>• Knows all matter is made of atoms and molecules that are always in motion</li> <li>• Understands matter can be classified as solid, liquid, or gas based on whether the shape and volume are definite and variable</li> <li>• Knows all particles have kinetic energy</li> <li>• Knows the identity of a substance does not change during a change of state, but the energy of a substance does</li> <li>• Knows fluids exert pressure evenly in all directions</li> <li>• Knows all fluids exert an upward buoyant force on matter</li> <li>• Knows fluids move faster through small areas than large areas if the overflow rate is constant</li> <li>• Knows gas laws help predict the behavior of gases in specific situations</li> </ul>	<p><b>Phase Changes</b></p> <ul style="list-style-type: none"> <li>• Creates a table that explains the difference between a solid, liquid, and gas</li> <li>• Provides examples of states of matter</li> <li>• Analyzes the relationship between temperature and kinetic energy</li> <li>• Designs and explains a simple experiment that represents a phase change</li> <li>• Explains how the Laws of Conservation apply to phase changes</li> <li>• Shows how buoyant forces act on a rubber duck or other object in water to keep it afloat</li> <li>• Compares the viscosity of fluids</li> <li>• Shows Archimedes' principle is used to find buoyant force</li> <li>• Explains how hydraulic devices are based on Pascal's principle</li> <li>• Compares viscosity of various fluids</li> </ul>	<p>Physical Science Curriculum Guide</p>

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Course Level Benchmarks	Course Level Benchmarks	Course Level Benchmarks	Course Level Benchmarks	Course Level Benchmarks
C. Recognizes patterns in the properties of matter (con't) <b>3. Bonds</b>	<b>Bonds</b> <ul style="list-style-type: none"> <li>• covalent bonding</li> <li>• ionic bonding</li> <li>• ion</li> <li>• molecule</li> <li>• molecular compound</li> <li>• ionic compound</li> <li>• chemical formula</li> <li>• structural formula</li> <li>• octet rule</li> <li>• Lewis dot structures</li> <li>• empirical formula</li> <li>• molecular formula</li> </ul>	<b>Bonds</b> <ul style="list-style-type: none"> <li>• Knows atoms are made up of a positive nucleus surrounded by negative electrons</li> <li>• Knows an atom's electron configuration determines how the atom can interact with other atoms</li> <li>• Knows atoms form bonds to other atoms by transferring or sharing electrons</li> </ul>	<b>Bonds</b> <ul style="list-style-type: none"> <li>• Draws and interprets Lewis dot structures and electron configurations regarding the bonding between atoms of ionic and covalent compounds</li> <li>• Combines anions and cations to form compounds</li> <li>• Writes empirical and molecular formulas</li> </ul>	Physical Science Curriculum Guide

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Course Level Benchmarks	Course Level Benchmarks	Course Level Benchmarks	Course Level Benchmarks	Course Level Benchmarks
<p>C. Recognizes patterns in the properties of matter (con't)</p> <p><b>4. Solutions</b></p>	<p><b>Solutions</b></p> <ul style="list-style-type: none"> <li>• soluble</li> <li>• solubility</li> <li>• solvent</li> <li>• solute</li> <li>• surface area</li> <li>• saturated</li> <li>• hydration</li> <li>• concentration</li> <li>• nonpolar</li> <li>• water molecule</li> <li>• water properties</li> <li>• water quality</li> </ul>	<p><b>Solutions</b></p> <ul style="list-style-type: none"> <li>• Knows parts of a solution</li> <li>• Understands the factors that affect the dissolving process</li> <li>• Understands compounds are more or less soluble in a solvent</li> <li>• Knows water is good at dissolving compounds</li> <li>• Knows water is the universal solvent</li> </ul>	<p><b>Solutions</b></p> <ul style="list-style-type: none"> <li>• Contrasts the properties of a solution that differ from the properties of its solvent and solute</li> <li>• Describes the processes that can occur when substances dissolve</li> <li>• Identifies the factors that determine the solubility of a solute</li> <li>• Explains how the formation of a solution involves energy</li> <li>• Examines the properties of water</li> <li>• Evaluates human impact on water quality</li> </ul>	<p>Physical Science Curriculum Guide</p>