PHYSICAL Science
Scope and Sequence

National Science Standards	Unit 1 Matter	Unit 2 Types of Substances	Unit 3 Interactions of Matter	Unit 4 Matter in Motion	Unit 5 Energy at Work	Unit 6 Sound and Light	Unit 7 Magnetism and Electricity
Unifying Concepts and Processes							
• Systems, order, and organization	•	•	•	•	•	•	•
• Evidence, models, and explanation	•	•	•	•	•	•	•
• Change, constancy, and measurement	•	•	•	•	•	•	•
• Form and function	•	•	•	•	•	•	•
Science as Inquiry							
Abilities Necessary to Do Scientific Inquiry							
• Identify questions that can be answered through scientific investigations.	•	•	•	•	•	•	•
• Design and conduct a scientific investigation.	•	•	•	•	•	•	•
• Use appropriate tools and techniques to gather, analyze, and interpret data.	•	•	•	•	•	•	•
• Develop descriptions, explanations, predictions, and models using evidence.	•	•	•	•	•	•	•
• Think critically and logically to make the relationships between evidence and explanations.	•	•	•	•	•	•	•
• Recognize and analyze alternative explanations and predictions.	•	•	•	•	•	•	•
• Communicate scientific procedures and explanations.	•	•	•	•	•	•	•
• Use mathematics in all aspects of scientific inquiry.	•	•	•	•	•	•	•

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	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Understandings About Scientific Inquiry							
• Different kinds of questions suggest different kinds of scientific investigations.	•	•	•	•	•	•	•
• Current scientific knowledge and understanding guide scientific investigations.	•	•	•	•	•	•	•
• Mathematics is important in all aspects of scientific inquiry.	•	•	•	•	•	•	•
• Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.	•	•	•	•	•	•	•
• Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories.	•	•	•	•	•	•	•
• Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry.	•	•	•	•	•	•	•
• Scientific investigations sometimes result in new ideas and phenomena for study, generate new methods or procedures for an investigation, or develop new technologies to improve the collection of data.	•	•	•	•	•	•	•
Grades 5 – 8 Physical Science Content Standards							
Properties and changes of properties in matter							
• A substance has characteristic properties, such as density, boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.	•	•					
• Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways.	•	•	•				
• Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.	•	•	•				

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	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Motion and Forces							
• The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.				•			
• An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.				•			
• If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.				•			
Transfer of Energy							
• Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.				•	•	•	•
• Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.					•	•	
• Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object, light from that object – emitted by or scattered from it – must enter the eye.						•	
• Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.							•
• In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.			•	•	•	•	•
• The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.					•	•	
Grades 9 – 12 Physical Science Content Standards							
Structure of Atoms							
• Matter is made of minute particles called atoms, and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge.	•	•					

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
• The atom's nucleus is composed of protons and neutrons, which are much more massive than electrons. When an element has atoms that differ in the number of neutrons, these atoms are called different isotopes of the element.	•	•					
• The nuclear forces that hold the nucleus of an atom together, at nuclear distances, are usually stronger than the electric forces that would make it fly apart. Nuclear reactions convert a fraction of the mass of interacting particles into energy, and they can release a much greater amounts of energy than atomic interactions. Fission is the splitting of a large nucleus into smaller pieces. Fusion is the joining of two nuclei at extremely high temperature and pressure and is the process responsible for the energy of the sun and other stars.					•		
• Radioactive isotopes are unstable and undergo spontaneous nuclear reactions, emitting particles and/or wavelike radiation. The decay of any one nucleus cannot be predicted, but a large group of identical nuclei decay at a predictable rate. This predictability can be used to estimate the age of materials that contain radioactive isotopes.					•		
Structure and Properties of Matter							
• Atoms interact with one another by transferring or sharing electrons that are farthest form the nucleus. These outer electrons govern the chemical properties of the element.	•	•					
• An element is composed of a single type of atom. When elements are listed in order according to the number of protons (called the atomic number), repeating patterns of physical and chemical properties identify families of elements with similar properties. This Periodic Table is a consequence of the repeating pattern of outermost electrons and their permitted energies.	•	•					
• Bonds between atoms are created when electrons are paired up by being transferred or shared. A substance composed of a single kind of atom is called an element. The atoms may be bonded together into molecules or crystalline solids. A compound is formed when two or more kinds of atoms bind together chemically.	•	•					
• The physical properties of compounds reflect the nature of the interactions among their molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them.	•	•					
• Solids, liquids, and gases differ in the distances between molecules or atoms and therefore the energy that binds them together. In solids the structure is nearly rigid; in liquids molecules or atoms move around each other but do not move apart; and in gases molecules or atoms move almost independently of each other and are far apart.	•	•					

PHYSICAL Science
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	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
• Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life.		•					
Chemical Reactions							
• Chemical reactions occur all around us. Complex chemical reactions involving carbon-based molecules take place constantly in every cell in our bodies.	•	•					
• Chemical reactions may release or consume energy. Some reactions such as the burning of fossil fuels release large amounts of energy by losing heat and by emitting light. Light can initiate many chemical reactions such as photosynthesis.					•	•	
• A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms. In other reactions, chemical bonds are broken by heat or light to form very reactive radicals with electrons ready to form new bonds. Radical reactions control many processes such as the presence of ozone and greenhouse gases in the atmosphere, the burning and processing of fossil fuels, the formation of polymers, and explosions.		•	•				
• Reaction rates depend on how often the reacting atoms and molecules encounter one another, on the temperature, and on the properties – including shape – of the reacting species.			•				
• Catalysts, such as metal surfaces, accelerate chemical reactions. Chemical reactions in living systems are catalyzed by protein molecules called enzymes.			•				
Science and Technology							
Abilities of Technological Design							
• Identify appropriate problems for technologic design		•	•	•			
• Design a solution or product		•	•	•			
• Implement a proposed design		•		•			•
• Evaluate completed technological designs or products				•			•
• Communicate the process of technological design				•			•
Understandings About Science and Technology							
• Scientific inquiry and technological design have similarities and differences.		•	•				
• Many different people in different cultures have made and continue to make contributions to science and technology.	•	•	•	•	•	•	•

PHYSICAL Science
Scope and Sequence

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
• Science and technology are reciprocal.	•					•	
• Perfectly designed solutions do not exist.			•	•			
• Technological designs have constraints.		•	•	•			•
• Technological solutions have intended benefits and unintended consequences.	•	•	•		•		•
Science in Personal and Social Perspectives							
Personal Health							
• The potential for accidents and the existence of hazards imposes the need for injury prevention.		•	•			•	•
• Natural environments may contain substances (for example, radon and lead) that are harmful to human beings. Maintaining environmental health involves establishing or monitoring quality standards related to use of soil, water, and air.		•	•		•	•	
Populations, Resources, and Environments							
• When an area becomes overpopulated, the environment will become degraded due to the increased use of resources.		•					
• Causes of environmental degradation and resource depletion vary from region to region and from country to country.		•	•		•		
Natural Hazards							
• Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans.			•		•	•	•
• Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal.		•		•	•	•	
• Natural hazards can present personal and societal challenges.		•	•			•	
Risks and benefits							
• Students should understand the risks associated with natural hazards, chemical hazards, biological hazards, social hazards, and personal hazards.		•	•			•	
• Individuals can use a systematic approach to thinking critically about risks and benefits.	•	•	•		•		•
Science and Technology in Society							
• Science influences society through its knowledge and world view.			•			•	

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	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
• Societal challenges often inspire questions for scientific research, and social priorities often influence research.						•	•
• Technology influences society through its products and processes.		•	•	•		•	•
• Science and technology have advanced through contributions of many different people, in different cultures, at different times in history.	•	•	•	•	•	•	•
• Scientists and engineers work in many different settings.	•		•	•	•	•	•
• Scientists and engineers have ethical codes.	•				•		
• Science cannot answer all questions and technology cannot solve all human problems.					•	•	
History and Nature of Science							
Science as a Human Endeavor							
• Women and men of various social and ethnic backgrounds engage in the activities of science, engineering, and related fields.	•	•	•	•	•	•	•
• Science requires different abilities.	•	•	•	•	•	•	•
Nature of Science							
• Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models.	•	•	•	•	•	•	
• It is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered.			•	•		•	
• It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists.	•				•	•	
History of Science							
• Many individuals have contributed to the traditions of science.	•	•	•	•	•	•	
• In historical perspective, science has been practiced by different individuals in different cultures.	•	•	•	•	•	•	•
• Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach the conclusions that we currently take for granted.	•	•					•

PHYSICAL Science
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Skills	Unit 1 Matter	Unit 2 Types of Substances	Unit 3 Interactions of Matter	Unit 4 Matter in Motion	Unit 5 Energy at Work	Unit 6 Sound and Light	Unit 7 Magnetism and Electricity
Science Process Skills							
• Observing	•	•	•	•	•	•	•
• Inferring	•	•	•	•	•	•	•
• Predicting	•	•	•	•	•	•	•
• Measuring	•	•	•	•	•	•	•
• Calculating	•	•	•	•	•	•	•
• Classifying	•	•	•	•	•		•
• Using tables and graphs	•	•	•	•	•	•	•
• Developing and using models	•	•	•	•	•	•	•
• Posing questions	•	•	•	•	•	•	•
• Designing experiments (investigations)	•	•	•	•	•	•	•
• Formulating hypotheses	•	•	•			•	•
• Forming operational definitions	•	•	•	•	•	•	•
• Controlling variables	•	•	•	•		•	•
• Analyzing data	•	•	•	•	•	•	•
• Making conclusions	•	•	•	•	•	•	•
• Communicating results	•	•	•	•	•	•	•
◦ Construct and present arguments using evidence to support the claim	•	•	•	•		•	•
◦ Integrate qualitative scientific and technical information to support the claim	•	•	•	•		•	•
• Evaluating and revising the experimental design		•	•	•			•

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	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Critical Thinking Skills							
• Comparing and contrasting	•	•	•	•	•	•	•
• Applying concepts and scientific principles to design, construct, and test a device				•		•	•
• Interpreting data, diagrams, and photographs	•	•	•	•	•	•	•
• Making judgments	•			•	•	•	•
• Problem solving	•	•	•	•			•
• Using analogies		•	•			•	•
• Relating cause and effect	•	•	•	•	•	•	•
• Making generalizations	•	•	•	•			
• Using mathematical representations	•		•	•		•	•
Graphic Organizers							
• Concept maps and web diagrams	•	•				•	
• Compare and contrast tables		•	•	•	•	•	•
• Venn diagrams	•	•				•	
• Flow charts				•			
• Cycle diagrams	•		•				
• Tables	•	•	•	•	•	•	•