SCIENCE
RHINEBECK PRIORITIZED CURRICULUM
Grade 6
The Physical Setting

Standard 4:	**Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.**
Key Idea 1:	**The Earth and celestial phenomena can be described by principles of relative motion and perspective.**

Background:

The universe is comprised of a wide array of objects, many of which can be seen by the unaided eye. Others can only be observed with scientific instruments. These celestial phenomena, distinct from Earth, are in motion relative to Earth and each other. Measurements of these motions vary with the perspective of the observer. Cyclical changes on Earth are caused by interactions among object in the universe.

Guiding Questions:

How do cyclical events allow the solar system to function?
What makes the solar system a system?

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Standard 4: Key Idea 1: Performance Indicator 1.1: Explain daily, monthly, and seasonal changes on Earth.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
1.1a Earth's Sun is an average-sized star. The Sun is more than a million times greater in volume than Earth. 1.1b Other stars are like the Sun but are so far away that they look like points of light. Distances between stars are vast compared to distances within our solar system. 1.1c The Sun and the planets that revolve around it are the major bodies in the solar system. Other members include comets, moons, and asteroids. Earth's orbit is nearly circular. 1.1d Gravity is the force that keeps planets in orbit around the Sun and the Moon in orbit around the Earth. 1.1e Most objects in the solar system have a regular and predictable motion. These motions explain such phenomena as a day, a year, phases of the Moon, eclipses, tides, meteor showers, and comets. 1.1f The latitude/longitude coordinate system and our system of time are based on celestial observations 1.1h The apparent motions of the Sun, Moon, Planets, and stars across the sky can be explained by Earth's rotation and revolution. Earth's rotation causes the length of one day to be approximately 24 hours. This rotation also causes the Sun and Moon to appear to rise along the eastern horizon and to set along the western horizon. Earth's revolution around the Sun defines the length of the year as 365 ¼ days. 1.1i The tilt of Earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth. The length of daylight varies depending on latitude and season. 1.1j The shape of Earth, the other planets, and stars is nearly spherical.	E N N E E N E E E	▪ What's is the Sun? ▪ How far away is the Sun? ▪ How long does light from the sun take to reach earth? ▪ What else makes up our solar system? ▪ Are you really sitting still in your chair? ▪ What force keeps us from flying off our chair? ▪ What force keeps the earth/planets from flying off? ▪ How does "day" and "night" change over in a year in New York? ▪ What is the reason for night and day? ▪ What is the reason for the seasons? ▪ Why is it cold in Australia in July?	• NASA's Making Sun-Earth Connections (video clips with voice captions; posters; photos with captions) • NASA's The Dynamic Sun (video clips with voice captions) • Kids Discover The Sun • Kids Discover The Solar System • The Nature of Science, Prentice Hall text • Exploring the Universe, Prentice Hall text • Guided reading, note-taking, and treasure hunt • Children's picture books (read aloud) - The Earth and Sky, Scholastic - My First Book About Space, Western Publ. - What's Out There?, Grosset and Dunlap ▪ The Reasons for Seasons, Little, Brown, and Co. ▪ Predictions: for how length of day will change over the year ▪ Data analysis: rise/set/length of day July-June ▪ Hypotheses: students record what they think the reason is for night and day and then for the seasons: words and pictures ▪ Hands-on investigations: - Globes, lights… - Flashlight and graph paper - Orbitors: Sun-Earth models ▪ Science Court: Seasons (an interactive multimedia program) ▪ Transparencies ▪ Simulations	▪ Illustrated project folder: minimum of one sun fact ▪ Concept mapping ▪ Student responses ▪ Journal/notebook entries ▪ Teacher observations ▪ Line graphs: Length of Day in NY July-June ▪ Visuals with paragraphs: Reason for Night and Day, Reason for the Seasons ▪ Checklists and rubrics created/provided ▪ Multiple choice/ short answer quiz/test	

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Standard 4:	**Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.**
Key Idea 2:	**Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.**

Background:

Students should develop an understanding of Earth as a set of closely coupled systems. The concept of systems provides a framework in which students can investigate three major interacting components: lithosphere, hydrosphere, and atmosphere. Processes act within and among the three components on a wide range of time scales to bring about continuous change in Earth's crust, oceans, and atmosphere.

Guiding Questions:

How do the lithosphere, hydrosphere and atmosphere interact?
How have the lithosphere, hydrosphere and atmosphere changed over time?
How are rocks affected by changes in the lithosphere, hydrosphere and atmosphere?

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Standard 4: Key Idea 2: Performance Indicator 2.1: Explain how the atmosphere (air), hydrosphere (water), and lithosphere (land) interact, evolve, and change.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
2.1a Nearly all the atmosphere is confined to a thin shell surrounding Earth. The atmosphere is a mixture of gases, including nitrogen and oxygen with small amounts of water vapor, carbon dioxide, and other trace gases. The atmosphere is stratified into layers, each having distinct properties. Nearly all weather occurs in the lowest layer of the atmosphere. 2.1c The rock at Earth's surface forms a nearly continuous shell around Earth called the lithosphere. 2.1d The majority of the lithosphere is covered by a relatively thin layer of water called the hydrosphere. 2.1e Rocks are composed of minerals. Only a few rock-forming minerals make up most of the rocks of the Earth. Minerals are identified on the basis of physical properties such as streak, hardness, and reaction to acid. 2.1g The dynamic processes that wear away Earth's surface include weathering and erosion. 2.1h The process of weathering breaks down rocks to form sediment. Soil consists of sediment, organic material, water, and air. 2.1j Water circulates through the atmosphere, lithosphere, and hydrosphere in what is known as the water cycle.	E E I E E E I	▪ What are the layers of "our material world" Earth? ▪ What is soil made up of? ▪ What are minerals? ▪ How can we tell one mineral from another? ▪ How does rock become soil? ▪ How do plants get the nutrients they need?	▪ 3-D model of Earth: cross section ▪ Create graph showing percentage of atmospheric gases ▪ Posters/transparencies ▪ Video: Out of Rock ▪ Science Court: Soil ▪ Mapping ▪ Diagrams/visual (student generated) ▪ Topsoil Tour ▪ Dynamic Earth, Prentice Hall ▪ Demonstrations ▪ Lab - detecting (observing) - collecting clues (properties) - solving mysteries (using key to ID minerals)	▪ Student responses ▪ Teacher observations ▪ Student generated maps, diagrams, visuals ▪ Student notebook entries ▪ Lab results; chart accuracy and completeness ▪ Performance assessment: identify a mineral	

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Standard 4: Key Idea 2: Performance Indicator 2.2: Describe volcano and earthquake patterns, the rock cycle, and weather and climate changes.

Essential Knowledge/Skills (Major Understandings)	*Priority Code*	*Essential Questions*	*Classroom Ideas*	*Assessment Ideas*	*Time/Notes*
2.2a The interior of Earth is hot. Heat flow, and movement of material within Earth, cause sections of the Earth's crust to move. This may result in earthquakes, volcanic eruption, and the creation of mountains and ocean basins. 2.2d Continents fitting together like puzzle parts and fossil correlations provided initial evidence that continents were once together. 2.2e The Theory of Plate Tectonics explains how the "solid" lithosphere consists of a series of plates that "float" on the partially molten section of the mantle. Convection cells within the mantle may be the driving force for the movement of the plates. 2.2f Plates may collide, move apart, or slide past one another. Most volcanic activity and mountain building occur at the boundaries of these plates. Often resulting in earthquakes. 2.2i Weather describes the conditions of the atmosphere at a given location for a short period of time. 2.2j Climate is the characteristic weather that prevails from season to season and year to year. 2.2k The uneven heating of Earth's surface is the cause of weather. 2.2r Substances enter the atmosphere naturally and from human activity. Some of these substances include dust from volcanic eruptions and greenhouse gases such as carbon dioxide, methane, and water vapor. These substances can affect weather, climate, and living things.	I I I I N N I E	▪ How do density differences cause changes in our world? ▪ Earthquakes, volcanoes, and mountains? ▪ Weather? ▪ What is the greenhouse effect? Do we need it? ▪ What is the Global Warming?	• Density labs: hot vs. cold water • Demo showing convection currents in water • 3-D model of Earth: cross-section • Intro to Geology: Formation of Continents and Mountains (video) with diagrams to color and label • Guided readings with diagrams • Dynamic Earth, Prentice Hall text • U.S. Geological Survey Map The Dynamic Earth • Copy of continents to cut and piece together • Demo with light bulb, pencil and spiral-cut paper circle • Visuals: movement of air when Earth is not rotating vs. is rotating • Science Court: Seasons • The Greenhouse Effect, multimedia clip • Our Greenhouse Earth, Cricket Magazine • Earth vs. Venus; reading and compare/ contrast diagram • Student generated visuals: The Greenhouse Effect - sources of gases - greenhouse gases in atmosphere - energy: light, heat ▪ "Belching Out Pollution", "Does My Gas Cause Global Warming?" and other current articles	▪ Lab records ▪ Teacher observations ▪ Student responses/ explanations ▪ Journal/ notebook entries ▪ Accuracy of diagrams ▪ Rubrics to assess performance tasks and projects	

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Standard 4:	**Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.**
Key Idea 3:	**Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.**

Background:

Objects in the universe are composed of matter. Matter is anything that takes up space and has mass. Matter is classified as a substance or a mixture of substances.
Knowledge of the structure of matter is essential to students' understanding of the living and physical environments. Matter is composed of elements, which are made of small particles called atoms. All living and non-living material is composed of these elements.

Guiding Questions:

How is the knowledge of the structure of matter essential to understanding living and physical systems?

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Standard 4: Key Idea 3: Performance Indicator 3.1: Observe and describe properties of materials, such as density, conductivity, and solubility.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
3.1a Substances have characteristic properties. Some of these properties include color, odor, phase at room temperature, density, solubility, heat and electrical conductivity, hardness, and boiling and freezing points. 3.1c The motion of particles helps to explain the phases (states) of matter as well as changes from one phase to another. The phase in which matter exists depends on the attractive forces among its particles. 3.1d Gases have neither a determined shape nor a definite volume. Gases assume the shape and volume of a closed container. 3.1e A liquid has a definite volume, but takes the shape of a container. 3.1f A solid has a definite shape and volume. Particles resist a change in position. 3.1g Characteristic properties can be used to identify different materials, and separate a mixture of substances into its components. For example, iron can be removed from a mixture by means of a magnet. An insoluble substance can be separated from a soluble substance by such processes as filtration, settling, and evaporation 3.1h Density can be described as the amount of matter that is in a given amount of space. If two objects have equal volume, but one has more mass, the one with more mass is denser. 3.1i Buoyancy is determined by comparative densities.	E E E E E I E E	▪ How can you identify the materials each of the blocks is made out of? ▪ How do particles behave in a solid? liquid? gas? ▪ How does this affect the shape and volume of each phase? ▪ What is the mass of 100ml of water at room temperature? 1ml of water? ▪ How do you find the density of a material? ▪ Why does a raw egg sink in just water, but float in salt water? ▪ Why does a copper penny sink in the river but a huge oak tree floats?	▪ Brainstorming and mapping density in the world around us ▪ Problem solving lab ▪ Liquid layers lab, GEM ; adapt form burglary/crime lab ▪ The Magic Egg ▪ Lab demo determining the densities of materials ▪ Same mass, different volume ▪ Same volume, different mass ▪ Rocks ▪ <u>Archimedes and the King's Gold Crown</u>: read aloud, think, brainstorm and predict the ending ▪ Demos: grape vs. lemon - diet vs. regular coke - ironwood vs. pine, etc.	▪ Student responses ▪ Student maps ▪ Lab, data chart and conclusions ▪ Teacher observations ▪ Debriefing ▪ Lab records ▪ Student predictions ▪ Quiz: The Case of the Missing Crown (ID the Gold Crown)	

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Standard 4: Key Idea 3: Performance Indicator 3.2: Distinguish between chemical and physical changes.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
3.2a During a physical change a substance keeps its chemical composition and properties. Examples of physical changes include freezing, melting, condensation, boiling, evaporation, tearing, and crushing. 3.2d Substances are often placed in categories if they react in similar ways. Examples include metals, nonmetals, and noble gases. 3.2e The Law of Conservation of Mass states that during an ordinary chemical reaction matter cannot be created or destroyed. In chemical reactions, the total mass of the reactants equals the total mass of the products.	E E E	▪ What is the difference between the physical and chemical properties of a material? ▪ What is the difference between metals and non-metals? ▪ Where has the water in your body been before? The oxygen in your lungs? ▪ Where does the garbage go?? ▪ What is the role of decomposers?	▪ Element Bingo ▪ Element Research Projects ▪ "Family" tables of elements ▪ Ice and Heat lab ▪ Matter: How is it Put Together, video and follow up ▪ Classify elements based on properties ▪ Models of atoms forming molecules→any left? ▪ Chemical equations balance; photosynthesis and respiration ▪ "Caesar's Last Breath", Earthsearch Exploratbook, Klutz ▪ "Life Cycle" of a plastic bottle..pencil ▪ Flow diagram of a garbage incinerator ▪ Soil ecosystems	▪ Rubric assessment of project ▪ Student responses ▪ Lab records ▪ Teacher observation ▪ Mapping	

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Standard 4: Key Idea 3: Performance Indicator 3.3: Develop mental models to explain common chemical reactions and changes in states of matter.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
3.3a All matter is made up of atoms. Atoms are far too small to see with a light microscope. 3.3b Atoms and molecules are perpetually in motion. The greater the temperature, the greater the motion. 3.3c Atoms may join together in well-defined molecules or may be arranged in regular geometric patterns. 3.3d Interactions among atoms and/or molecules result in chemical reactions. 3.3e The atoms of any one element are different from the atoms of other elements. 3.3f There are more than 100 elements. Elements combine in a multitude of ways to produce compounds that account for all living and non-living substances. Few elements are found in their pure form. 3.3g The periodic table is one useful model for classifying elements. The periodic table can be used to predict properties of elements (metals, nonmetals, noble gases)	E E E E E E E	▪ What is our material world made up of? ▪ What's "wrong" with our Bohr models of the atom? ▪ What is the difference between an oxygen atom and a calcium atom? ▪ What does the periodic table tell us about an element?	▪ Matter: What is it? Video and follow up ▪ Periodic Table (in notebook, posters, and element bingo) ▪ "Atoms Family", song, storytelling, map and photo album ▪ Building atoms (models) ▪ Labs: - map with chips (3 colors) - magnetic map with magnets (3 colors) ▪ Drawing Bohr models ▪ Powers of Ten video ▪ Matter Prentice Hall text ▪ "Atomic Poetry", The Science Book ▪ Tao of Physics, readings ▪ Writing "Atomic Poetry" ▪ Element research projects ▪ Lab: Mystery Element- Problem solving lab ▪ Lab: Building Molecules- Molecular model kits	▪ Student responses ▪ Accuracy of maps ad photo albums ▪ Lab records ▪ Teacher observation ▪ Accuracy of models ▪ Debriefing ▪ Quality and accuracy of student generated poems ▪ Rubric to assess performance task/rubric	

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Standard 4:	**Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.**
Key Idea 4:	**Energy exists in many forms, and when these forms change energy is conserved.**

Background:

An underlying principle of all energy use is the Law of Conservation of Energy. Simply stated, energy cannot be created or destroyed.

Energy can be transformed, one form to another. These transformations produce heat energy. Heat is a calculated value, which includes the temperature of the material, the mass of the material, and the type of the material. It should be noted that temperature is not a measurement of heat.

Guiding Questions:

How is electrical energy produced and transformed?
What are the effects of the production of electricity and its transformation?

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Standard 4: Key Idea 4: Performance Indicator 4.1: Describe the sources and identify the transformations of energy observed in everyday life.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
4.1a The Sun is a major source of energy for Earth. Other sources of energy include nuclear and geothermal energy. 4.1b Fossil fuels contain stored solar energy and are considered nonrenewable resources. They are a major source of energy in the United States. Solar energy, wind, moving water, and biomass are some examples of renewable energy resources. 4.1c Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automobile engine. Energy, in the form of heat, is almost always one of the products of energy transformations. 4.1d Different forms of energy include heat, light, electrical, mechanical, sound, nuclear, and chemical. Energy is transformed in many ways.	E I I I	▪ What runs our "material world"? ▪ Where does our energy come from to make our bodies work?	• Sun facts (see 1.1, 2.1 Physical Setting) • Posters of Sun and interior Earth • "Toast" video and map • Greenhouse Effect (2.2r) ▪ "Out of Rock" video • "Bottom of the Barrel" video • "Energy, What is it?" video • Lab: Geothermal Energy- A Down to Earth Adventure	▪ Illustrated project folder ▪ Journal/notebook entries ▪ Student responses ▪ Mapping "Energy" check accuracy and completeness ▪ Diagram of waste burn plant energy transferred accurately? ▪ Flow diagrams showing energy transfers/ transformations	

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Standard 4: Key Idea 4: Performance Indicator 4.2: Observe and describe heating and cooling events.					
Essential Knowledge/Skills (Major Understandings)	***Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
4.2c During a phase change, heat energy is absorbed or released. Energy is absorbed when a solid changes to a liquid and when a liquid changes to a gas. Energy is released when a gas changes to a liquid and when a liquid changes to a solid. +4.2d Most substances expand when heated and contract when cooled. Water is an exception, expanding when changing to ice.	E E	▪ Do molecules need energy or give off energy as they change from one phase to another? ▪ How does a thermometer work? ▪ Why do water molecules take up more space when they freeze than when they are in liquid form? Is this the exception or the rule for materials?	▪ Ice and heat lab ▪ Graph with diagrams ▪ Simulations/ role playing ▪ Sara Stein, The Science Book, "Invisible" ▪ Matter: How is it Put Together, video and follow up	▪ Checklist and rubric to assess completeness an accuracy of visual/graph ▪ Student responses ▪ Applications: how do thermometers work? ▪ Notebook/ journal entries ▪ Accuracy of lab records/graphs ▪ Mapping	

Standard 4: Key Idea 4: Performance Indicator 4.5: Describe situations that support the principle of conservation of energy.					
Essential Knowledge/Skills (Major Understandings)	***]Priority Code***	***Essential Questions***	***Classroom Ideas***	***Assessment Ideas***	***Time/Notes***
4.5a Energy cannot be created or destroyed, but only changed from one form into another.	I	▪ Where does the energy go?	▪ Life Cycle Analysis of Materials ▪ Analogy to counting boy's blocks each day (see Six Easy Pieces, Feymann) ▪ Energy: What Is It? Video and follow up ▪ Sara Stein's The Science Book Invisibles	▪ Student responses ▪ Accuracy of map	

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Resource Materials			
Title	**Source**	**Title**	**Source**
Periodic Table: posters, student notebook, Collection (real stuff)	varies	Matter: Building Block of the Universe (text)	Prentice Hall
The Science Book by Sara Stein	Workman Publishing	The Nature of Matter (text)	Glencoe Science
The Life Cycle of Everyday Stuff	NSTA Press	Molecular Model Building Kits	
Science Court: Soil (CD)	Tom Snyder Productions	Atomic Model placemats & chips	
Topsoil Tour	La Motte	Elements Explorer CD-ROM	McGraw Hill
Women in Science (CD)	Tom Snyder Productions	Library Resources re elements	
The Greenhouse Effect (video)	Scott Resources	Out of Rock video	National Energy Foundation
EarthSearch by John Cassidy	Klutz, 1994	Bottom of the Barrel video	3-2-1 Contact
Matter : What Is It? video	United Learning, Inc	The Rotten Truth video	3-2-1 Contact
Matter: How Is It Put Together?	United Learning, Inc	Lab Materials & Equipment	Ward's and Frey Scientific
Energy: What Is It? video	United Learning, Inc	triple beam balances, overflow cans and catch buckets, graduated cylinders…	