

Unit	Topic	Lesson	Objectives
The Nature of Science			
	Introduction to Physical Science		
	What Is Science?		
			Define science and identify questions that science cannot answer.
			Compare and contrast theories and laws.
			Identify a system and its components.
			Identify the three branches of science.
	Science in Action		
			Identify some skills scientists use.
			Define hypothesis.
			Recognize the difference between observation and inference.
	Models in Science		
			Describe various types of models.
			Discuss limitations of models.
	Evaluating Scientific Explanation		
			Evaluate scientific explanations.
			Evaluate promotional claims.
	What Is Technology?		
			Identify the steps in the technology design process, and describe what is involved in each step.
			Describe the parts of a technological system.
			Explain how society and technology affect each other.
	Measurement		
	Description and Measurement		
			Determine how reasonable a measurement is by estimating.
			Identify and use the rules for rounding a number.
			Distinguish between precision and accuracy in measurement.
	SI Units		
			Identify the purpose of SI.
			Identify the SI units of length, volume, mass, temperature, time and rate.
	Drawings, Tables, and Graphs		
			Describe how to use pictures and tables to give information.
			Identify and use three types of graphs.
			Distinguish the correct use of each type of graph.

Unit	Topic	Lesson	Objectives
Chemical Building Blocks			
	Matter		
		What Is Matter?	
			Explain the relationship between matter, atoms, and elements.
			Distinguish between elements and compounds.
			Describe molecules, and explain how they are formed.
			Interpret and write some common chemical formulas.
			Categorize materials as pure substances or mixtures.
		Properties of Matter	
			Distinguish between the physical and chemical properties of matter, and give examples of each.
			Perform calculations involving density.
			Explain how materials are suited for different uses based on their physical and chemical properties and give examples.
			Describe characteristic properties, and give examples.
		Changes of Matter	
			Explain physical change, and give examples of physical changes.
			Explain chemical change, and give examples of chemical changes.
			Compare and contrast physical and chemical changes.
			Describe how to detect whether a chemical change has occurred.
	Solids, Liquids, and Gases		
		States of Matter	
			Describe the characteristics of a solid.
			Describe the characteristics of a liquid.
			Describe the characteristics of a gas.
		Changes of State	
			Explain what happens to a substance during changes between solid and liquid.
			Explain what happens to a substance during changes between liquid and gas.
			Explain what happens to a substance during changes between solid and gas.
		Gas Behavior	
			List the types of measurements used when working with gases.
			Explain how the volume, temperature, and pressure of a gas are related.

Unit	Topic	Lesson	Objectives
	Atoms, Elements, and the Periodic Table		
	Atomic Structure		
			Explain Dalton's atomic theory, and describe why it was more successful than Democritus's theory.
			State the charge, mass, and location of each part of an atom according to the modern model of the atom.
			Compare and contrast Bohr's model with the modern model of the atom.
	A Guided Tour of the Periodic Table		
			Relate the organization of the periodic table to the arrangement of electrons within an atom.
			Explain why some atoms gain or lose electrons to form ions.
			Determine how many protons, neutrons, and electrons an atom has, given its symbol, atomic number, and mass number.
			Describe how the abundance of isotopes affect an element's average atomic mass.
	Why Do Atoms Combine?		
			Identify how electrons are arranged in an atom.
			Compare the relative amounts of energy of electrons in an atom.
			Compare how the arrangement of electrons in an atom is related to its place in the periodic table.
	Metals		
			List the physical properties of metals.
			Explain how the reactivity of metals changes across the periodic table.
			Explain how the elements that follow uranium are produced.
	Nonmetals and Metalloids		
			Describe the properties of nonmetals.
			Tell how metalloids are useful.
	Radioactive Elements		
			Describe how radioactivity was discovered.
			Identify the types of particles and energy that radioactive decay can produce.
			Describe how radioactive isotopes are useful.
	The Structure of Matter		
	Compounds and Molecules		
			Distinguish between compounds and mixtures.
			Relate the chemical formula of a compound to the relative numbers of atoms or ions present in the compound.
			Use models to visualize a compound's chemical structure.
			Describe how the chemical structure of a compound affects its properties.

Unit	Topic	Lesson	Objectives
		Ionic Bonds	
			Describe ions, and explain how they form bonds.
			Explain how the formulas and names of ionic compounds are written.
			Identify the properties of ionic compounds.
		Covalent Bonds	
			State what holds covalently bonded atoms together.
			Identify the properties of molecular compounds.
			Explain how unequal sharing of electrons occurs and how it affects molecules.
		Compound Names and Formulas	
			Name simple ionic and covalent compounds.
			Predict the charge of a transition metal cation in an ionic compound.
			Write chemical formulas for simple ionic compounds.
			Distinguish a covalent compound's empirical formula from its molecular formula.
		Organic and Biochemical Compounds	
			Describe how carbon atoms bond covalently to form organic compounds.
			Identify the names and structures of groups of simple organic compounds and polymers.
			Identify what makes up the polymers that are essential to life.
		Chemical Reactions	
		The Nature of Chemical Reactions	
			Recognize some signs that a chemical reaction may be taking place.
			Explain chemical changes in terms of the structure and motion of atom and molecules.
			Describe the differences between endothermic and exothermic reactions.
			Identify situations involving chemical energy.
		Reaction Types	
			Distinguish among the five general types of chemical reactions.
			Predict the products of some reactions based on the reaction type.
			Describe reactions that transfer or share electrons between molecules, atoms, or ions.
		Balancing Chemical Equations	
			Demonstrate how to balance chemical equations.
			Interpret chemical equations to determine the relative number of moles of reactants needed and moles of products formed.
			Explain how the law of definite proportions allows for predictions about reaction amounts.
			Identify mole ratios in a balanced chemical equation.
			Calculate the relative masses of reactants and products from a chemical equation.

Unit	Topic	Lesson	Objectives
		Rates of Change	
			Describe the factors affecting reaction rates.
			Explain the effect a catalyst has on a chemical reaction.
			Explain chemical equilibrium in terms of equal forward and reverse reaction rates.
			Apply Le Chatelier's principle to predict the effect of changes in concentration, temperature, and pressure in an equilibrium process.
		Acids, Bases, and Solutions	
		Understanding Solutions	
			State the characteristics of solutions, colloids, and suspensions.
			Describe what happens to the particles of a solute when a solution forms.
			Explain how solutes affect the freezing point and boiling point of a solvent.
		Concentration and Solubility	
			Describe how concentration is measured.
			Explain why solubility is useful in identifying substances.
			Identify factors that affect the solubility of a substance.
		Describing Acids and Bases	
			Names the properties of acids and bases.
			Identify where acids and bases are commonly used.
		Acids and Bases in Solution	
			State what kinds of ions acids and bases form in water.
			Explain what pH tells you about a solution.
			Describe what happens in a neutralization reaction.
		Digestion and pH	
			Explain why the body must digest food.
			Describe how pH affects digestion.
		Carbon Chemistry	
		Simple Organic Compounds	
			Explain why carbon is able to form many compounds.
			Describe how saturated and unsaturated hydrocarbons differ.
			Identify isomers of organic compounds.
		Other Organic Compounds	
			Describe how new compounds are formed by substituting hydrogens in hydrocarbons.
			Identify the classes of compounds that result from substitution.

Unit	Topic	Lesson	Objectives
		Biological Compounds	
			Describe how large organic molecules are made.
			Explain the roles of organic molecules in the body.
			Explain why eating a balanced diet is important for good health.
Motion, Forces, and Energy			
	Motion		
		Measuring Motion	
			Explain the relationship between motion and a frame of reference.
			Relate speed to distance and time.
			Distinguish between speed and velocity.
			Solve problems related to time, distance, displacement, speed, and velocity.
		Acceleration	
			Define acceleration.
			Predict what effect acceleration will have on motion.
		Momentum	
			Explain the relationship between mass and inertia.
			Define momentum.
			Predict motion using the law of conservation of momentum.
	Force and Newton		
		Newton's First Law	
			Distinguish between balanced and net forces.
			Describe Newton's First law of motion.
			Explain how friction affects motion.
		Newton's Second Law	
			Describe Newton's second law of motion.
			Identify the factors that affect the gravitational force between two objects.
			Explain why objects accelerate during free fall.
			Explain why the direction of force is important.
		Newton's Third Law	
			Identify the relationship between the forces that objects exert on each other.
		Rockets and Satellites	
			Explain how a rocket lifts off the ground.
			Describe the forces that keep a satellite in orbit.

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	Forces in Fluids		
		Pressure	
			Explain what pressure depends on.
			Explain how fluids exert pressure.
			Describe how fluid pressure changes with elevation and depth.
		Why Do Objects Float?	
			Explain how the pressure in a fluid produces a buoyant force.
			Define density.
			Explain floating and sinking using Archimedes' principle.
		Doing Work with Fluids	
			Explain how forces are transmitted through fluids.
			Describe how a hydraulic system increases force.
			Describe Bernoulli's principle.
	Work and Simple Machines		
		Work and Power	
			Recognize when work is done.
			Calculate how much work is done.
			Explain the relationship between work and power.
		Using Machines	
			Explain how a machine makes work easier.
			Calculate the mechanical advantages and efficiency of a machine.
			Explain how friction reduces efficiency.
		Simple Machines	
			Distinguish among the different simple machines.
			Describe how to find the mechanical advantage of each simple machine.
	Energy		
		What Is Energy?	
			Describe how energy, work, and power are related.
			Name and describe the two basic kinds of energy.
		Forms of Energy	
			Explain how an object's mechanical energy is determined.
			Name some forms of energy associated with the particles that make up objects.

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		Energy Transformations and Conservation	
			Describe how different forms of energy are related.
			Name common energy transformations.
			State the law of conservation of energy.
		Energy and Fossil Fuels	
			Identify the source of the energy stored in fossil fuels.
			Describe how energy is transformed when fossil fuels are used.
	Thermal Energy and Heat		
	Temperature, Thermal Energy, and Heat		
			Name the three common temperature scales.
			Describe how thermal energy is related to temperature and heat.
			Explain the significance of a high specific heat.
	Heat		
			Explain the difference between thermal energy and heat.
			Describe three ways heat is transferred.
			Identify materials that are isolators or conductors.
	Uses of Heat		
			Describe how heat engines use thermal energy.
			Describe how refrigerators keep things cold.
Waves, Sound, and Light			
	Waves		
	What Are Waves?		
			Explain what causes mechanical waves.
			Describe two types of waves and how they can be represented.
	Characteristics of Waves		
			Identify the crest, trough, amplitude, and wavelength of a wave.
			Define the terms frequency and period.
			Solve problems involving wave speed, frequency, and wavelength.
			Describe the Doppler effect.
	Interactions of Waves		
			Describe how reflection, refraction, and diffraction change a wave's direction.
			State the different types of interference.
			Explain how standing waves form.

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		Seismic Waves	
			Identify the types of seismic waves.
			Explain how a seismograph works.
	Sound		
		Sound	
			Recognize what factors affect the speed of sound.
			Relate loudness and pitch to properties of sound waves.
			Explain how harmonics and resonance affect the sound from musical instruments.
			Describe the function of the ear.
			Explain how sonar and ultrasound imaging work.
		Music	
			Explain the difference between music and noise.
			Describe how different instruments produce music.
			Explain how you hear.
		How You Hear Sound	
			Describe the function of each section of the ear.
			Identify what causes hearing loss.
	Electromagnetic Waves		
		The Nature of Electromagnetic Waves	
			State what an electromagnetic wave consists of.
			Identify models that explain the behavior of electromagnetic waves.
		Waves of the Electromagnetic Spectrum	
			Explain how electromagnetic waves are alike and how they are different.
			Name the waves that make up the electromagnetic spectrum.
		Using Electromagnetic Waves	
			Describe different ways of using electromagnetic waves to communicate.
			Compare and contrast AM and FM radio signals.
	Light		
		Properties of Light	
			Describe the wave nature of light.
			Explain how light interacts with materials.
			Determine why objects appear to have color.

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		Reflection and Mirrors	
			Explain how light is reflected from rough and smooth surfaces.
			Determine how mirrors form an image.
			Describe how concave and convex mirrors form an image.
		Refraction and Lenses	
			Determine why light rays refract.
			Explain how convex and concave lenses form images.
		Using Mirrors and Lenses	
			Explain how microscopes magnify objects.
			Explain how telescopes make distant objects visible.
			Describe how a camera works.
Electricity and Magnetism			
	Electricity		
		Electric Charge and Static Electricity	
			Explain how electric charges interact.
			Explain what an electric field is.
			Describe how static electricity builds up and transfers.
		Electric Current	
			Explain how an electric current is produced.
			Explain how conductors are different from insulators.
			Describe what causes electric charges to flow in a circuit.
			Explain how resistance affects current.
		Batteries	
			Describe what the first battery was made of.
			Explain how an electrochemical cell works.
		Electric Circuits and Power	
			Explain what Ohm's law is.
			Describe the basic features of an electric circuit.
			Identify how many paths currents can take in series and parallel circuits.
			Explain how to calculate electric power and the energy used by an appliance.
		Electrical Safety	
			Describe measures that help protect people from electrical shocks and short circuits.

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	Magnetism		
		What Is Magnetism?	
			Explain what the properties of a magnet are.
			Explain how magnetic poles interact.
			Describe the shape of a magnetic field.
		Inside a Magnet	
			Explain how an atom can behave like a magnet.
			Describe how magnetic domains are arranged in a magnetic material.
			Explain how magnets can be changed.
		Magnetic Earth	
			Explain how Earth is like a bar magnet.
			Describe the effects of Earth's magnetic field.
	Using Electricity and Magnetism		
		What Is Electromagnetism?	
			Explain how an electric current is related to a magnetic field.
			Identify some characteristics of a magnetic field.
			Describe the characteristics of an electromagnet.
		Electricity, Magnetism, and Motion	
			Explain how electrical energy can be transformed in to mechanical energy.
			Describe how a galvanometer works.
			Describe what an electric motor does.
		Electricity from Magnetism	
			Explain how an electric current can be produced in a conductor.
			Describe how a generator works.
			Describe the function of a transformer.
	Electronics		
		Electronic Signals and Semiconductors	
			Describe two types of electronic signals.
			Explain how semiconductors are used to make electronic components.
		Electronic Communication	
			Describe how sound is transmitted by telephone.
			Describe two ways that sound can be reproduced.
			Explain how electromagnetic waves are involved in the transmission of radio and television signals.

Unit	Topic	Lesson	Objectives
		Computers	
			Explain how information is sorted and processed in a computer.
			Describe the function of computer hardware and software.
			Describe the purpose of a computer network.
Our Universe, Our Galaxy, Our Earth			
		The Universe	
		The Life and Death of Stars	
			Describe the basic structure and properties of stars.
			Explain how the surface temperature of a star is measured.
			Recognize that all normal stars are powered by fusion reactions that form elements.
			Identify the stages in the evolution of stars.
		The Milky Way and Other Galaxies	
			Define galaxy, and identify Earth's home galaxy.
			Describe two characteristics of a spiral galaxy.
			Distinguish between the three types of galaxies.
			Describe two aspects of a quasar, and identify the tools scientists use to study quasars.
		Origin of the Universe	
			Describe the basic structure of the universe.
			Describe red shift, and explain what it tells scientists about our universe.
			State the main features of the big bang theory, and explain the evidence supporting the expansion of the universe.
			Explain how scientists are using tools and models to hypothesize what may happen to the universe in the future.
		The Solar System	
		Sun, Earth, and Moon	
			Recognize Earth as one of many planets that orbit the sun.
			Explain how gravity works within the solar system.
			Describe eclipses and phases of the moon.
			List two characteristics of the moon, and show how the moon affects Earth's tides.
		The Inner and Outer Planets	
			Identify the planets of the solar system and their features.
			Distinguish between the inner and outer planets and their relative distances from the sun.
			State two characteristics that allow Earth to sustain life.
			Describe two characteristics of a gas giant.

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		Formation of the Solar System	
			Contrast ancient models of the solar system with the current model.
			Estimate the age of our solar system.
			Summarize two points of the nebular model, and describe how it can explain astronomical observations.
			Explain how scientists think the moon was formed.
	Planet Earth		
		Earth's Interior and Plate Tectonics	
			Identify Earth's different geologic layers.
			Explain how the presence of magnetic bands on the ocean floor supports the theory of plate tectonics.
			Describe the movement of Earth's lithosphere using the theory of plate tectonics.
			Identify the three types of plate boundaries and the principal structures that form at each of these boundaries.
		Earthquakes and Volcanoes	
			Identify the causes of earthquakes.
			Distinguish between primary, secondary, and surface waves in earthquakes.
			Describe how earthquakes are measured and rated.
			Explain how and where volcanoes occur.
			Describe the different types of volcanoes.
		Minerals and Rocks	
			Identify the three types of rock.
			Explain the properties of each type of rock based on physical and chemical conditions under which the rock formed.
			Describe the rock cycle and how rocks change form.
			Explain how the relative and absolute ages of rocks are determined.
		Weathering and Erosion	
			Distinguish between chemical and physical weathering.
			Explain how chemical weathering can form underground caves in limestone.
			Describe the importance of water to chemical weathering.
			Identify three different physical elements that can cause erosion.
	The Atmosphere		
		Characteristics of the Atmosphere	
			Identify the primary layers of the atmosphere.
			Describe how the atmosphere has evolved over time.
			Describe how the oxygen-carbon dioxide cycle works, and explain its importance to living organisms.
			Discuss the recent changes in Earth's atmosphere.

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		Water and Wind	
			Describe the three phases of the water cycle.
			Explain how temperature and humidity are related.
			Identify various cloud types by their appearance and the altitudes at which they typically occur.
			Use the concept of pressure gradients to explain how winds are created, and explain how Earth's rotation affects their direction.
		Weather and Climate	
			Describe the formation of cold fronts and warm fronts.
			Describe various severe weather situations, including thunderstorms, tornadoes, and hurricanes.
			Distinguish between climate and weather.
			Identify factors that affect Earth's climate.
		Using Natural Resources	
		Organisms and Their Environment	
			Explain the structure of an ecosystem.
			Describe the effects one species can have on an ecosystem.
			Discuss two ways natural forces can change ecosystems.
			Discuss two ways humans can change ecosystems.
		Energy and Resources	
			Identify different sources of energy used by living things, and trace each source back to the sun.
			Describe the advantages and disadvantages of several energy sources.
			Describe the types of conversion processes necessary for different energy sources to produce electricity.
			Identify how efficient different conversion processes are.
		Pollution and Recycling	
			Identify several pollutants caused by fossil fuel use.
			Compare the economic and environmental impacts of using various energy sources.
			Describe types of pollution in air, in water, and on land.
			Identify ways to reduce, reuse, and recycle.