

Unit	Lesson	Lesson Objectives
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Matter and Its Properties**Introduction to Matter**

- Describe how to measure mass and volume.
- Differentiate between mass and weight.
- Explain what makes up matter.

Physical Properties

- Describe and give examples of physical properties of matter.
- Explain how and why matter is conserved during a physical change.
- Explain what happens during a physical change.
- Identify examples of physical changes.

Density

- Calculate the mass, volume, or density of an object given the other two measurements.
- Determine whether an object will sink or float relative to the density of the surrounding liquid.
- Explain density and state the SI units used to measure it.

Lab: Density of Solids

- Calculate the density of several solid objects.
- Measure the mass and volume of various solid objects.
- Use density to identify an unknown substance.

States of Matter

- Describe the arrangement and motion of atoms in the different states of matter.
- Discriminate the characteristics of solids, liquids, and gases.

Changes of State

- Describe what happens during the different changes of state.
- Explain how energy is related to changes of state.

Chemical Properties

- Describe and give examples of chemical properties of matter.
- Differentiate between physical and chemical changes.
- Explain what happens during a chemical change.
- Identify examples of chemical changes.

Atoms, Elements, and the Periodic Table**Atomic Theory**

- Compare the models of the atom put forth by Dalton, Thomson, Rutherford, and Bohr.
- Describe the development of the modern model of the atom.

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Atoms

Describe the parts of an atom.

Identify the masses, locations, and charges of protons, neutrons, and electrons.

Elements

Describe what an isotope is and explain how isotopes of the same element are different.

Examine the properties of an element.

Explain how ions form.

Periodic Table

Describe the organization of the periodic table.

Determine an element's symbol, atomic number, and mass number from the periodic table.

Examine the history of the periodic table.

Metals

Describe the characteristic properties of metals.

Explain how and why the reactivity of metals changes in the periodic table.

Identify the location of metals in the periodic table.

Nonmetals

Describe the characteristic properties of nonmetals.

Explain how and why the reactivity of nonmetals changes in the periodic table.

Identify the location of nonmetals in the periodic table.

Metalloids

Describe the characteristic properties of metalloids.

Explain why most metalloids are used as semiconductors.

Identify the location of metalloids in the periodic table.

Radioactivity

Describe applications of radioactive isotopes.

Explain radioactive decay.

Perform calculations involving the half-life of a radioactive isotope.

Summarize the discovery of radioactivity.

Chemical Bonding and Reactions**Chemical Bonding**

Complete electron dot diagrams.

Explain why atoms bond.

Identify the three types of bonds.

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Ionic Bonds

- Describe characteristics of ionic bonds.
- Explain how ionic bonds form.
- Give examples of ionic compounds.
- Identify the properties of ionic compounds.

Covalent Bonds

- Describe characteristics of covalent bonds.
- Explain how covalent bonds form.
- Give examples of covalent compounds.
- Identify the properties of covalent compounds.

Lab: Ionic and Covalent Bonds

- Design and conduct an experiment to test the properties of substances.
- Draw conclusions about the type of bond in a substance based on the tested properties of that substance.
- Science Practice: Compare your conclusions about the identity of the bonds in substances to published information about those substances.

Compounds

- Describe the defining characteristics of a compound.
- Determine the number of atoms of each element in a chemical formula.
- Explain how chemical formulas represent compounds.
- Use models to visualize the chemical structure of a compound.

Polymers

- Describe the uses of natural and synthetic polymers.
- Examine the benefits and limitations of using synthetic polymers.
- Explain the formation of polymers.

Balancing Chemical Equations

- Demonstrate how to balance a chemical equation.
- Explain what it means for a chemical equation to be balanced.
- Relate balanced chemical equations to the law of conservation of mass.

Types of Chemical Reactions

- Distinguish among the types of chemical reactions.
- Predict the product of each type of chemical reaction.

Rate of Chemical Reactions

- Describe the factors that affect the rate of a chemical reaction.
- Explain activation energy and its importance to chemical reactions.
- Recognize how a catalyst and an inhibitor affect a chemical reaction.

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Lab: Rate of Chemical Reactions

Describe the signs of a chemical reaction.

Identify how temperature and surface area affect the rate of a chemical reaction.

Science Practice: Conduct several controlled tests of multiple variables using repeated trials during an investigation about chemical reaction rate.

Mixtures, Solutions, Acids, and Bases**Mixtures**

Compare and contrast types of mixtures.

Distinguish between substances and mixtures.

Identify the properties of a mixture.

Solubility

Define solubility and recognize that substances have different solubilities.

Describe factors that affect the rate of dissolving.

Describe types of solutions.

Identify factors that affect the solubility of a substance.

Properties of Acids and Bases

Compare the properties of acids and bases.

Describe common uses for acids and bases.

Acids and Bases in Solution

Classify acids and bases based on strength.

Describe what happens when acids and bases are put in water.

Explain how pH can be used to identify an acid or base.

Summarize what happens during a neutralization reaction.

Lab: Acids and Bases

Determine the pH of various solutions using a multi-use indicator.

Show how pH is based on the concentration of H⁺ and OH⁻ in solution.

Motion and Forces**Introduction to Motion**

Describe the position of an object.

Distinguish between distance and displacement.

Explain how an object's motion is relative to a reference point or frame.

Speed and Velocity

Differentiate between speed and velocity.

Interpret graphs of distance versus time.

Solve problems involving distance, time, speed, and/or velocity.

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		Acceleration <ul style="list-style-type: none">Describe the concept of acceleration.Interpret graphs of velocity versus time.Solve problems involving velocity, time, and acceleration.
		Lab: Motion <ul style="list-style-type: none">Graph changes in motion.Interpret data to determine acceleration.Measure distance and time to determine speed.
		Introduction to Forces <ul style="list-style-type: none">Describe the concept of force.Distinguish between balanced and unbalanced forces and their effect on motion.Explain how to determine the net force on an object.
		Friction <ul style="list-style-type: none">Describe friction and explain what causes it to occur.Explain how friction can be reduced or increased depending on the application.Identify and describe the different types of friction.
		Gravity <ul style="list-style-type: none">Describe how gravity affects projectile motion.Describe Newton's law of universal gravitation.Explain the concept of free fall.Identify and describe the factors that affect the gravitational force between two objects.
		Newton's Laws of Motion <ul style="list-style-type: none">Describe Newton's first law of motion and how it relates to inertia.Explain Newton's third law of motion and how it relates to action and reaction forces.Identify applications of Newton's three laws of motion.Use Newton's second law of motion to calculate force, mass, and acceleration.
		Lab: Newton's Laws of Motion <ul style="list-style-type: none">Demonstrate Newton's first law.Verify Newton's second law by changing the variables F, m, or a.
		Technological Design <ul style="list-style-type: none">Compare and contrast technological design and scientific investigation.Describe the four stages of technological design.Evaluate a technological design or product to determine if it meets designated criteria.

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		Momentum <ul style="list-style-type: none">Apply Newton's third law of motion to understand what happens to momentum when two objects collide.Define and calculate momentum.Explain how momentum is conserved.
		Energy
		Introduction to Energy <ul style="list-style-type: none">Define energy.Explain how energy and work are related.Identify and describe the different forms of energy.
		Potential and Kinetic Energy <ul style="list-style-type: none">Calculate the kinetic energy in a system.Calculate the potential energy in a system.Distinguish between potential and kinetic energy.Explain how energy is transferred in a moving system.
		Lab: Kinetic Energy <ul style="list-style-type: none">Calculate the kinetic energy of objects of different mass.Determine the kinetic energy of objects at different speeds.Graph data to illustrate changes in kinetic energy.
		Energy Transformations <ul style="list-style-type: none">Explain how energy changes form.Identify examples of energy transformations.Summarize the law of conservation of energy.
		Nonrenewable Resources <ul style="list-style-type: none">Explain how nonrenewable resources are converted into usable energy.Explain the processes that create nonrenewable resources.Identify examples of nonrenewable energy sources.Recognize advantages and disadvantages of using nonrenewable resources.
		Renewable Resources <ul style="list-style-type: none">Identify examples of renewable energy sources.Distinguish between renewable and nonrenewable energy sources.Explain how renewable resources are converted into usable energy.Recognize advantages and disadvantages of using renewable resources.

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Thermal Energy and Heat Transfer**Temperature and Thermal Energy**

Describe how temperature is measured.

Convert temperature readings between different temperature scales.

Describe how thermal energy relates to temperature.

Explain how temperature relates to kinetic energy.

Heat

Distinguish between heat and thermal energy.

Explain why some substances change temperature more easily than others.

Predict how thermal energy flows between objects at different temperatures.

Conduction

Distinguish between insulators and conductors.

Explain how molecular movement transfers thermal energy by conduction.

Identify situations in which conduction occurs.

Convection

Describe the motion of liquids and gases due to convection.

Explain how fluid movement transfers thermal energy by convection.

Identify situations in which convection occurs.

Radiation

Describe the role of color and texture in absorbers and reflectors.

Explain how electromagnetic waves transfer energy by radiation.

Identify situations in which radiation occurs.

Lab: Thermal Energy Transfer

Determine how mass affects the amount of thermal energy transferred.

Investigate how different materials transfer thermal energy.

Observe and compare the specific heat of water with the specific heat of other substances.

Waves, Sound, and Light**Introduction to Waves**

Compare and contrast transverse waves and longitudinal waves.

Define waves and explain how they carry energy.

Distinguish between mechanical waves and electromagnetic waves.

Properties of Waves

Calculate the speed of a transverse wave.

Describe how a wave's amplitude is related to the energy the wave carries.

Describe the relationship between the frequency and wavelength of a wave.

Explain why waves travel at different speeds.

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		<p>Wave Interactions</p> <ul style="list-style-type: none">Describe how a wave's direction is changed by reflection, refraction, and diffraction.Differentiate between constructive and destructive interference.Explain what happens when waves interact.
		<p>Sound Waves</p> <ul style="list-style-type: none">Describe how sound waves are produced and how they travel.Explain how different materials and different temperatures affect the speed of sound waves.Identify the features of a sound wave.
		<p>Using Sound</p> <ul style="list-style-type: none">Describe the uses of ultrasound technology.Explain how and why animals use echolocation.Summarize the ways in which sound waves are used for communication.
		<p>The Electromagnetic Spectrum</p> <ul style="list-style-type: none">Describe the different parts of the electromagnetic spectrum.Distinguish how electromagnetic waves differ from one another.Identify how different types of electromagnetic waves are used.
		<p>Properties of Light</p> <ul style="list-style-type: none">Describe the wave and particle models of light.Explain what happens when light interacts with objects.Recognize what determines the color of an object.
		<p>Reflection and Mirrors</p> <ul style="list-style-type: none">Describe how a mirror forms an image.Describe the law of reflection.Explain how light is reflected from a surface.Identify the types of images formed by different kinds of mirrors.
		<p>Refraction and Lenses</p> <ul style="list-style-type: none">Analyze ray diagrams for a lens.Describe how a lens forms an image.Explain how light is refracted when it passes from one medium to another.Identify the types of images formed by different kinds of lenses.
		<p>Using Light</p> <ul style="list-style-type: none">Describe how magnifying glasses, microscopes, telescopes, and cameras work.Differentiate laser light from regular light and identify uses of lasers.Identify uses of fiber optics.

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Electricity and Magnetism		
Electric Charge		
Analyze the factors that affect the strength of an electric force.		
Describe the electric field due to a charge.		
Determine how electric charges interact.		
Explain how electrons cause objects to become electrically charged.		
Magnets and Magnetism		
Describe Earth's magnetic field.		
Describe the properties of magnets.		
Determine how magnetic poles interact with each other.		
Illustrate the magnetic field around a magnet.		
Lab: Magnetic and Electric Fields		
Demonstrate and describe electric fields.		
Demonstrate and describe magnetic fields.		
Show how magnetic and electric fields are related.		
Electromagnetism		
Describe the characteristics of solenoids and electromagnets.		
Explain how an electric current is produced by a magnet.		
Indicate how magnetism is produced by electric currents.		