

Science 300

Unit	Lesson Title	Lesson Objectives
1 YOU GROW AND CHANGE		
	Your Body Breathes Air	Understand that the body needs air Describe how air enters the body
	The Body Needs Oxygen Experiment S301A-Breathing Patterns	Understand that animals need oxygen to live Measure brathing patterns
	Experiment S301B-Your Lungs Your Body Digests Food Experiment S301C-Taste Test Your Body Exercises and Rests	Understand that the body needs oxygen Feel how lungs move during breathing Describe how food moves through the digestive system Compare how foods pass through a paper towel Understand that muscles and bones are important Describe how the heart and diaphragm work Describe how bones help the body
	Experiment S301D-Taking Your Pulse Project S301E-Bone Numbers Your Body is Different from an Animal	Practice taking a pulse. Understand that a pulse tells how fast the heart is beating Understand that the body is made of many bones Describe the differences between humans and animals
2 PLANTS		
	Plant Parts	Describe the jobs of roots, stems, and leaves List the plant parts that store food
	Experiment S302A-Root Hairs Experiment S302B-Study a Stem Plant Growth	Study root hairs on a plant Study the stem of a plant List the things plants need to grow. Explain how plants get carbon dioxide
	Experiment S302C-Grow Some Plants Plant Changes	Test how light affects plant growth Understand that plants grow and change in different ways. List four ways plants can grow
	Experiment S302D-Watch Bean Seeds Grow	Understand that plants come from seeds List the things seeds need to grow
	Experiment S302E-Plant a Piece of Potato Experiment S302F-Bean Plant	Study the growth of a potato plant Study the growth of a bean plant. Understand that some parts of a plant grow faster than other parts

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3 ANIMALS: GROWTH AND CHANGE		
	Animals and The Environment	List the things animals need from the environment. Understand that different animals live in different environments
	Experiment S303A-Hourly Temperature Changes	Study how temperature changes with time
	Experiment S303B-Heat Energy Comparison	Compare the energy needed to heat water and soil
	Project S303C-Desert Locations How Animals are Different	List world deserts and their locations Describe how animals are different from one another. Understand that animals are built for the environments they live in
	Animal Structures	Compare vertebrates and invertebrates. Describe the structure of reptiles, birds, and mammals. Define cold-bloodedness. Compare insects and spiders
	Project S303D-Vertebrate Chart Eating and Breathing	Group vertebrates by special characteristics Understand that birds use their beaks and feet in different ways to get food. Describe how different animals breathe
	Project S303E-Sort Birds By Type How Animals Grow and Change	Sort bird pictures by diet Describe the metamorphosis of a butterfly. Understand that amphibians live in water and on land. Describe mammal babies
	Project S303F-Sow Bug Environment	Study the behavior of sow bugs

4 YOU ARE WHAT YOU EAT		
	How to Build a Healthy Body	Describe how food helps the body. Use the food pyramid to categorize common foods
	How to Build a Healthy Body-2 How to Plan for Healthy Eating	Compare healthy and unhealthy foods List healthy food choices for breakfast, lunch, snack, and dinner
	Project S304A-Breakfast Chart	Track the foods you eat for breakfast. Understand that the body needs foods from each group
	Project S304B-Lunch Chart	Track the foods you eat for lunch. Understand that the body needs foods from each group
	Project S304C-Dinner Chart	Track the foods you eat for dinner. Understand that the body needs foods from each group
	Project S304D-Chart Totals	Total the foods you ate for breakfast, lunch, and dinner. Understand that the body needs foods from each group
	How to Form Good Health Habits Caring for the Eyes and Body	Describe healthy dental habits Describe healthy habits for the body and eyes

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5 PROPERTIES OF MATTER		
	Chemistry and Robert Boyle	Understand that chemists study matter. Identify Robert Boyle as a famous chemist
	Experiment S305A-Be a Chemist Properties of Matter	Experiment with matter Define matter. Describe properties of common items.
	Experiment S305B-Volume	Understand that all matter has volume and mass
	Experiment S305C-Think about Mass	Understand that objects can have different weights and masses
	Experiment S305D-Is Air Matter?	Test the mass of air
	Project S305E-Matter List	List different types of matter
	Experiment S305F-Is Water Matter?	Test the mass of water
	Physical Changes	Describe the different properties of solids, liquids, and gasses. Give examples of physical change
	Experiment S305G-Mass Measurement	Compare the mass of matter in different states
	Experiment S305H-Melting Ice Cubes	Study how temperature affects ice cubes
	Chemical Changes	Understand that matter is made of tiny atoms and molecules.

6 SOUNDS AND YOU		
	Sounds are Made	Understand that sound is made from vibrations. Give examples of objects that make sound
	Experiment S306A-Vibrations	Experiment with sound vibrations from a drum
	Sounds are Different	Understand that sound travels in waves in all directions
	How Do Sounds Travel?	Describe the different vibrations made by high and low sounds. Describe how vocal sounds are made
	Experiment S306B-Sound Patterns	Understand that sound can travel through things
	Report S306C-Read About Sound	Write about sound
	Experiment S306D-High and Low Sounds	Study how vibration speed affects sound
	Experiment S306E-Loud or Soft?	Experiment with sound vibrations from a coffee can
	Sounds are Heard	Describe how the ear hears sound
	Experiment S306F-Think About Hearing	Compare how well sounds are heard
	Report S306G-How Animals Hear	Write about animal hearing

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7 TIME AND SEASONS		
	How the Earth Moves	Define rotation and revolution. Explain why the sun appears to move in the sky
	Experiment S307A-The Earth Experiment S307B-Night	Understand that it can not be light all over the earth at once Understand that when one side of the earth is light the other side is dark
	Experiment S307C-The Earth's Rotation Why Time Changes	Use a clay model to learn about the earth Identify the length of time in a day, year, and leap year. Understand that time is not the same all over the world. List the number of time zones in the world and in the United States
	Experiment S307D-Different Times	Understand that it is day during different times around the world
	Report S307E-Months Why Seasons Change	Write about how months got their names Understand that seasons are caused by the tilt of the earth's axis. Explain the difference in weather during summer and winter. Compare the seasons of the Northern and Southern hemispheres
8 ROCKS AND THEIR CHANGE		
	How Rocks are Formed: By Heat	Understand that the earth is made of rock. Identify the three layers of the earth. Describe how igneous rocks are formed
	Rocks Formed by Volcanoes	Describe igneous rocks are formed Give examples of past volcanic eruptions
	How Rocks are Formed: By Pressure	Describe how sedimentary rocks are formed. Understand that rocks are made of tiny crystals called minerals. Describe how metamorphic rocks are formed
	Experiment S308A-Bubbling Grains of Rock	Watch how vinegar reacts with limestone
	Rocks are Changed by Wind and Water	Understand that water carries rocks and soil to different places. Understand that wind can wear away rock
	Rocks are Changed by Heat and Plants	Describe how heat and cold can break rocks. Describe how plants can break rocks
	Rocks are Used for Building	Describe how marble, granite, limestone, and gems are used
	Report S308B-Mount Rushmore Rocks are Used for Enjoyment	Write about Mount Rushmore Explain how to collect rocks. Understand that gems are rare and valuable rocks

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9 HEAT ENERGY		
	Heat Energy (Part 1)	Identify five sources of heat. Define friction. List the things fire needs to burn
	Experiment S309A-Feeling Friction	Use friction to create heat
	Experiment S309B-Oxygen and Fire	Understand that fire needs oxygen to burn
	Heat Energy (Part 2)	Describe how electricity is created and used for heat. Identify the sun as the primary source of heat on earth. Explain the effect of color on light absorption
	Experiment S309C-Static Electricity	Create static electricity
	What Heat Energy Is and Does	Define heat energy. Describe how heat energy changes molecule movement. Explain how heat energy can change the state of matter
	Experiment S309D-Water Molecules	Understand that water molecules move faster in hot water
	Movement of Heat Energy	Describe how heat moves by radiation, conduction, and convection. Understand that heat causes gas to expand and rise
	Experiment S309E-Changing Liquid to Gas	Understand that heat can change liquid into gas
	Heat Energy Affects Our Lives	Compare the benefits and problems of heat energy Understand that energy must be used carefully

10 REVIEW		
	Physical Change: Change in Man	Review the important things people need to live. Review how people breathe. Review healthy and unhealthy foods
	Physical Change: Change in Plants	Review the jobs of plant roots, stems, and leaves. Review the
	Physical Change: Change in Animals	Review the important things animals need to live. Review the differences between invertebrates and vertebrates. Review the metamorphosis of insects
	The Earth	Review matter and describe the three states. Review how igneous, metamorphic, and sedimentary rocks are formed. Review how rocks can be eroded
	Seasons and Times	Review why the earth has seasons. Review why time of day is different around the world. Review the length of time in a day, year, and leap year
	Project S310A-Rock Collection	Write about rocks
	Sounds and Energy	Review sound as a vibration. Review how sound moves. Review five sources of heat energy. Review how heat can change the state of matter
	Experiment S310B-How Sound Travels	Understand that sound can travel through objects
	Experiment S310C-Temperature Comparisons	Study how color affects temperature

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1 PLANTS		
	Plant Life	Compare living and non-living things. Understand that plants are living things that grow
	Plants Used As Food and Shelter	Describe how plants are used for food. List examples of foods that come from plants. Describe how plants are used for shelter
	Project S401A-Things Made of Wood	List objects made of wood
	Report S401B-Read and Write Plants Used For Enjoyment and Symbols	Write about fruit grown in another country Understand that plants can be enjoyed. Understand that plants are used as state symbols
	Report S401C-Flowers as State Symbols	List state flowers
	Report S401D-Flower Paragraph Parts of Plants	Write about a state flower Identify the main parts of a plant. Describe the jobs of roots, stems, leaves, and flowers
	How Plant Parts Function	Describe how roots/root hairs, and plant stems function.
	Experiment S401E-Celery	Understand that tubes in plant stems carry water to leaves
	How Plant Parts Function (Part 2)	Identify two important functions of leaves. Describe photosynthesis and identify the materials needed to complete the process. Understand that when leaves decay they return nutrients to the soil
	How Plant Parts Function (Part 3)	Explain why flowers are important. Identify parts of a flower
2 ANIMALS		
	How Animals are Structured	Explain the difference between vertebrates and invertebrates. Describe characteristics of fish, reptiles, birds, and mammals. Describe characteristics of elephants
	Whales	Identify the largest mammal and largest land mammal Describe characteristics of whales
	Report S402A-Types of Whales	Compare three types of whales
	Birds	Describe the structure of a bird wing. Describe the migration of terns and swans
	Reptiles and Fish	Describe characteristics of reptiles and fish.
	Report S402B-Writing about Fish	Write about fish
	Project S402C-Observing Fish	Observe the behavior of fish
	How Animals Eat and Digest Food	Explain how teeth shape and diet are related. Describe digestion in an animal
	How Animals Breathe	Compare the breathing processes of fish, mammals, reptiles, birds, amphibians, and insects
	How Animals Act: Mammals	Describe how dogs and cats act when kept as pets
	How Animals Act: Salmon	Describe the life cycle of a salmon
	How Animals Act: Birds	Describe how ostriches and weaver birds act. Describe how birds defend their territory
	How Animals Act: Insects	Describe the behavior of bees and crickets. Calculate temperature using cricket chirps
	Report S402D-Honeybee Habits	Write about honeybees
	Animal Instinct	Define instinct. Describe how bats use sonar. Describe the instinctual behavior of sea turtles
	Man Protects Animals	Identify ways man protects animals
	Project S402E-Animal Scrapbook	Organize animal pictures by special characteristics

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3 MAN AND HIS ENVIRONMENT		
	Ecology	Define ecology and environment. Explain why ecology is called the "web of life"
	Project S403A-Your Environment Resources	Draw and describe your environment List four important environmental resources Describe the importance of water, air, light, and soil
	Food Chains	Compare food chains and food webs Trace the flow of energy through a food chain/web
	Ecosystem Populations	Describe the roles of producers, consumers, and decomposers Give examples of producers, consumers, and decomposers Explain why plants are the most important population
	Project S403B-Populations Balance of Nature	List the plant and animal populations in your environment Explain the importance of balance in an ecosystem Understand that producers must be the largest population for an ecosystem to survive
	Project S403C-Make a Pyramid Report S403D-Rabbits in Australia	Organize plants and animals in a population pyramid Explain how the balance of nature was upset for rabbits in Australia
	Water Communities	Describe the roles of organisms in a salt water and river communities
	Experiment S403E-Still Water Life Land Communities	Study plant and animal life in a still water community Identify and describe organisms in a field, desert, and forest communities
	Project S403F-Human Communities Report S403G-Read and Write Project S403H-Terrarium or Diorama Report S403I-Forest Community Misuse of the Environment	Write about the needs and structure of your community Write a story about the life of a bee Create and observe a desert terrarium Write about plant and animal life in a forest community Describe different types of erosion and pollution Describe ways to conserve resources and protect the environment Explain why many animals are endangered or extinct
	Project S403J-Ask an Expert	Interview an agricultural agent Write what you learned about soil
	Report S403K-Endangered Species	Write about an endangered animal
	Resource Conservation	Describe ways to replace natural resources Describe ways to conserve existing resource Explain how the sun can be used as a resource
	Report S403L-How to Save Energy	Write about renewable energy List ways to save energy
	Environmental Preservation Report S403M-Special Treasures	Describe how national parks preserve natural resources Write about a national park

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4 MACHINES		
	Machines Are Needed: Work	Understand that man has used machines to do work throughout history
	Report S404A-Galileo	Explain how gravity and friction affect machines
	Experiment S404B-Gravity	Read and answer questions about Galileo Galilie
	Machines Are Needed: Energy	Examine how air friction affects gravity
		Describe energy
		Compare potential and kinetic energy
		Explain the relationship between energy and force and work
	Simple Machines: Lever	Describe how a lever works
		Give examples of common levers
	Experiment S404C-Hammer and Nail	Compare work with and without use of a simple machine
	Experiment S404D-Seesaw	Examine how fulcrum location affects amount of work needed for a lever
	Simple Machines: Inclined Plane	Describe how an inclined plane works
		Give examples of common inclined planes
	Experiment S404E-Inclined Plane	Compare work with and without use of a simple machine
	Simple Machines: Wedge and Screw	Identify wedges and screws as special inclined planes
		Describe how wedges and screws work
		Give examples of common wedges and screws
	Experiment S404F-Screw and Nail	Compare the strength of a nail and a screw
	Simple Machines: Wheel and Axle	Describe how a wheel and axle works
		Describe how gears work
		Give examples of common wheels and axles and gears
	Simple Machines: Pulleys	Describe how a pulley works
		Compare fixed and block and tackle pulleys
		Define mechanical advantage
	Experiment S404G-Pulleys	Compare the mechanical advantage of two pulley types
	Compound Machines	Define compound machine
		Give examples of common compound machines

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5 ELECTRICITY AND MAGNETISM		
	Electricity	Identify lightning as an electrical charge Identify the three particles in an atom Describe what happens when an atom loses or gains electrons
	Report S405A-Thomas Edison Experiment S405B-Static Electricity	Write about Thomas Edison Examine the effects of static electricity
	Currents and Circuits	Describe Volta's electrical cell Compare conductors and insulators and give examples of each Compare the electrical flow in complete and broken circuits
	Project S405C-Conductors Experiment S405D-Wet Cell Project S405E-Electric Objects Electrical Use and Safety	Classify items as conductors or nonconductors Create a battery using wire and a lemon List household items that use electricity List uses for electricity in everyday life Describe the safety benefits of fuses and circuit breakers Describe electrical safety precautions
	Project S405F-Fuses in Use Magnetism	Study and write about car fuses Describe the properties of a magnet Define and give examples of electromagnets Explain how a generator makes electricity
	Experiment S405G-Use a Magnet Experiment S405H-Make a Magnet Experiment S405I-Magnet Poles Experiment S405J-Testing a Magnet	Test the attraction between a magnet and various objects Make a magnet from a nail Identify the poles of a magnet Test the north pole of a magnet
	Experiment S405K-Generate Electricity Experiment S405L-Electromagnet Report S405M-Explorers	Create an electrical current using a magnet Create an electromagnet Write about the explorers who discovered the North and South poles

Unit	Lesson Title	Lesson Objectives
6 WATER AND MATTER		
	Water	Identify the three states of water Describe what happens to water when it is heated and cooled
	Experiment S406A-Ice	Compare the Fahrenheit and Celsius temperature scales
	Experiment S406B-Ice Volume	Examine the properties of ice
	Water as a Liquid	Compare the volume of ice and water Identify sources of water in nature Describe the water cycle Describe the importance of water in the body
	Experiment S406C-Potato	Determine the amount of water in a potato
	Water as a Gas	Describe the water cycle Understand that when water condenses it changes from a gas to a liquid
	Experiment S406D-Forming Dew	Observe condensation
	Water as a Solvent	Compare soluble and insoluble substances Explain the difference between a solution and a suspension
	Experiment S406E-Solubility	Compare the solubility of different materials
	Matter	Describe the properties of solids, liquids, and gasses Compare mass and weight of matter Describe the properties of common items
	Molecules and Atoms	Understand that all matter is made of molecules Understand that molecules are made of atoms
	Experiment S406F-Molecules	Compare the strength of smell of perfume and ammonia
	Elements	Define element and give common examples Identify common elements by chemical sign
7 WEATHER		
	The Atmosphere	Understand that plants and animals need air to live Identify the levels of the atmosphere Describe the characteristics of the troposphere and stratosphere
	Experiment S407A-Air and Space	Determine if air has volume
	Temperature	Describe how the sun heats the air Compare temperatures at high and low elevations
	Experiment S407B-Temperature	Compare the effect of heat on different materials
	Air Pressure	Compare air pressure at high and low elevations Describe how wind is created by warm and cool air
	Experiment S407C-Pressure	Observe the effect of pressure
	Forces of Weather	Explain how thunder and lightning can be used to tell the distance of a storm Describe storm safety precautions Describe the characteristics of different types of storms
	Sand and Dust Storms	Describe the effects of sand and dust storms
	Report S407D-Hurricanes	Write about hurricanes
	Prediction of Weather	Describe how different instruments are used to measure and predict weather
	Project S407E-Thermometers	Compare Fahrenheit and Celsius thermometers

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8 OUR SOLAR SYSTEM AND THE UNIVERSE		
	A Trip Through Space	Order the eight planets in the solar system Describe characteristics of the eight planets
	Our Big Universe	Explain how the telescope was invented Describe how telescopes, spectroscopes, and radio telescopes help scientists study space
	Report S408A-Astronomy Instruments	Write about on the telescope, spectroscope, or radio telescope
	Essay S408B-Astronomy The Sun	Write about the importance of the sun in astronomy Describe the importance of the sun
	Essay S408C-Ancient People Movements	Explain the reason behind ancient beliefs about the sun Describe the movement of the sun Describe how gravity affects the motion of the sun and planets
	Report S408D-Isaac Newton Heavenly Bodies Around the Sun	Explain how Newton discovered gravity Write about Isaac Newton Compare revolution and rotation Describe the characteristics of planets, meteors, comets, and asteroids
	Our Moon	Describe the characteristics of the moon and its orbit Explain the importance of the Apollo 11 mission
	Experiment S408E-Moon Phases The Stars and Space	Use a model to create phases of the moon Compare astrology and astronomy Describe how stars are used to tell seasons, time, and direction
	Essay S408F-Astrology The Milky Way and Other Galaxies	Explain why astrology is a false science Identify our galaxy as the Milky Way Understand that the universe is infinite and contains many other galaxies
9 THE PLANET EARTH		
	The Air (Atmosphere)	Identify and describe the layers of the atmosphere
	Experiment S409A-Condensation Gases in the Atmosphere	Condense water on a glass Identify the gases in the atmosphere Understand that oxygen is necessary for life
	The Water (Hydrosphere)	Explain the importance of water Describe the distribution and sources of water on earth Describe the water cycle
	Essay S409B-Psalm 147 Salt Water	Interpret the meaning of Psalm 147 Describe the characteristics of oceans and seas Describe the effects of ocean currents
	Experiment S409C-Currents The Land (Lithosphere)	Create a convection current in water Identify the layers of the earth Describe the characteristics of each layer Describe how the spherical shape of the earth was discovered
	Experiment S409D-Shadows Earth's Land Formations	Compare the shadows made by a disk and a sphere Describe characteristics of mountains, plains, and volcanoes
	Earth's Rotation and Revolution	Describe the effects of earth's gravity and magnetism Describe the rotation and revolution of the earth

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10 UNDERSTANDING GOD'S WONDERFUL CREATION		
	Review: The Solar System	Understand that God created the universe Review the characteristics of the sun, moon, planets and stars
	Review: The Earth	Review the structure and function of plants Review the structure and behavior of animals Review how animals are protected by man
	Review: Matter	Review the properties of matter, molecules, and elements
	Review: Water	Review the states of matter Review the states of water Review the sources and uses of water
	Review: Weather	Review the states of water Review the sources and uses of water
	Project S410A-Weather Scrapbook	Create a scrapbook on different types of weather
	Review: Electricity and Magnetism	Review the effects of gravity on the earth and in space Review the parts of an atom Review electricity and electrical safety precautions Review magnetism and the use of electromagnets
	Project S410B-Thomas Alva Edison	List five facts about Thomas Edison
	Review: Machines	Review the use and structure of simple and compound machines
	Review: Ecology	Review the importance of balance in nature Review the flow of energy in a food chain/web Review organisms in forest, desert, river, ocean, and field communities
	Review: Conservation	Review ways to conserve energy and natural resources Review causes of pollution and erosion
	Report S410C-Passenger Pigeon	Write about passenger pigeons

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1 CELLS		
	The Basic Unit of Living Things: A Cell	Give a basic definition of a cell and explain what a cell is.
	Viewing Cells	Label the different basic parts of a cell.
	Experiment: Skin Cells	Identify different types of cells.
	The Life and Activity of Cells	Identify different types of cells.
		Use a microscope to examine examples of different types of cells.
		Label the different basic parts of a cell.
		Identify different types of cells.
		Explain in more detail the make-up of the cell membrane, cytoplasm, and nucleus.
	Plants and Unicellular Organisms	Examine some unique characteristics of different types of cells.
	Experiment: Onion Cells	Examine the structure of onion cells using a microscope
	Experiment: Pond Water Examination	Observe pond water organisms using a microscope
	Experiment: Cheek Cells	Examine cheek cells using a microscope
		Compare cheek and skin cells
	Experiment: Blood Cells	Examine blood cells using a microscope
	Tissue	Describe the function of plant tissue
		Describe the functions of different types of animal tissue
	Energy and Growth of Cells	Define what energy is and explain how plants and animals receive and produce energy.
	Cell Reproduction	Explain how cells reproduce and grow.

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2 PLANTS: LIFE CYCLES		
	Classifying Living Things and Plants	Classify all living things into one of five kingdoms. Explain differences between the main categories of plants, fungi, and protists.
	Parts of Plants	Identify the main kinds and parts of plants. Describe the life cycles of plants, fungi, and some protists.
	Seed Bearing Plants	Describe the life cycles of plants, fungi, and some protists. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.
	Flowering Plants	Identify the main reproductive parts of seed-bearing and spore-bearing organism.
	Experiment S502A-Flower Dissection	Identify the main reproductive parts of seed-bearing and spore-bearing organism.
	Fertilization	Identify the main reproductive parts of seed-bearing and spore-bearing organism. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.
	Experiment S502B-Seed Dissection	Identify the main reproductive parts of seed-bearing and spore-bearing organism.
	Cone-Bearing Plants	Identify the main reproductive parts of seed-bearing and spore-bearing organism.
	Project S502C-Examining Cones	Identify the main reproductive parts of seed-bearing and spore-bearing organism.
	Project S502D-Seed Hunt	Identify the main reproductive parts of seed-bearing and spore-bearing organisms.
	Spore Bearing Plants and Fungi	Describe the life cycles of plants, fungi, and some protists. Explain differences between the main categories of plants, fungi, and protists. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.
	Fern Plants	Identify the main reproductive parts of seed-bearing and spore-bearing organisms. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.
	Report S502E-Walking Fern	Explain differences between the main categories of plants, fungi, and protists.
	Fungi	1. Describe the life cycles of plants, fungi, and some protists. 2. Explain differences between the main categories of plants, fungi, and protists. 3. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.
	Experiment S502F-Mold	1. Describe the life cycles of plants, fungi, and some protists. 2. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.
	One-celled Living Things	1. Describe the life cycles of plants, fungi, and some protists. 2. Explain differences between the main categories of plants, fungi, and protists. 3. Relate the structure of plants, fungi, and protists with their reproduction in a life cycle.

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3 ANIMALS: LIFE CYCLES		
	Invertebrates: Life Cycles	Describe the life cycles of invertebrates. Explain the differences between the life cycles of invertebrates.
	One-celled Animal-like Protists	Identify protozoa as single celled organism Compare the structure of amoeba and paramecium Describe the reproduction of one-celled organisms
	Report S503A-Protozoa Egg-Laying Invertebrates	Identify characteristics of insects Compare the life stages of different insects Describe the reproduction of insects
	Experiment S503B-Mealworm Report S503C-The Spider Report S503D-Insect Study Worms and Mollusks	Observe the behavior and growth of a mealworm Research and answer questions about spiders Write about the life cycle of an insect Compare the life stages of a worms and mollusks Identify characteristics of worms and mollusks
	Vertebrates: Life Cycles	Identify characteristics of vertebrates Describe the life stages of vertebrates
	Egg-Laying Vertebrates	Describe the life cycle of salmon Explain why the theory of fish evolution into amphibians is false
	Egg-Laying Vertebrates (Part 2) Egg-Laying Vertebrates (Part 3)	Describe the life cycle of a frog Describe characteristics of reptiles, amphibians, and birds Describe the life cycles reptiles and robins
	Experiment S503E-Chicken Egg	Examine the external and internal structure of a chicken egg
	Live-Bearing Vertebrates	Describe characteristics of mammals Describe the life cycle of a mammal
	Report S503F-Mammals Essay S503G-God and Animals	Write about a mammal Write an essay on the meaning of Psalm 104

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4 BALANCE IN NATURE		
	Balance of Nature: Physical Environment	Identify factors that are required for life
	Project S504A-Cycles Ecosystems	Describe the water cycle Understand that organisms depend on each other Describe the carbon dioxide - oxygen cycle Explain the importance of carbon dioxide and oxygen for plants and animals Draw the water cycle, carbon cycle, and chemical cycle Define and identify producers, consumers, and decomposers
	Project S504B-Terrarium Project The Prairie: Web of Life	Identify and describe food chains in nature Explain why nature needs population differences between producers, consumers, and decomposers Build the terrarium. Explain what is meant by a food chain and to give examples. Know some details about the web of life in a prairie ecosystem
	Project S504C-Prairie Land The Prairie: Web of Life (Part 2)	List prairie lands in North America Define and identify producers, consumers, and decomposers
	Report S504D-Prairie Birds The Prairie: Food Chains	Identify and describe food chains in nature Explain why nature needs population differences between producers, consumers, and decomposers Write about a prairie bird Explain food chains
	Project S504E-Prairie Food Chain Project S504F-Special Environments	List food chains found in the prairie Write about an environment
	Humans and the Web of Life	Name two problems that human beings have made for God's web of life
	Humans and the Web of Life (Part 2)	Understand the nature of man's stewardship of the world

Unit	Lesson Title	Lesson Objectives
5 TRANSFORMATION OF ENERGY		
	Energy	Describe energy Identify forms of energy
	Work	Describe work
	Work From Energy	Understand work Define work Understand how to measure work
	Experiment S505A-Heat From the Sun	Investigate how light energy and temperature are related
	Forms of Energy	Describe forms of energy Define friction
	Experiment S505B-Heat from Bending	Investigate how movement and heat are related
	Experiment S505C-Heat Energy from a Chemical Reaction	Investigate how chemical energy and temperature are related
	Chemical Energy	Describe how chemical energy can be transformed into heat energy
	Energy in the Future	Explain the relationship between work and energy. Identify energy concerns of today that may be problems of the future. Describe several possible energy sources of the future.
	Future Sources of Energy	Describe several possible energy sources of the future.
	Experiment S505D-Solar Energy for Heat	Investigate how light energy and water temperature are related

6 RECORDS IN THE ROCK: THE FLOOD		
	Before the Flood: The Bible Record	Describe plant and animal life before the flood
	Before the Flood: The Physical Record	Describe plant and animal life before the flood
	The Flood: The Bible Record	Describe Bible records of the earth before, during and after the Flood
	Project: Interview with Noah	Write a news article about an interview with Noah
	The Flood: The Physical Record	Describe the physical record of the Flood
	Report S506B-Ancient Flood Stories	Research and answer questions about flood stories from other cultures
	After the Flood: The Bible Record	Describe Bible records of the earth before, during, and after the Flood. Identify changes in the earth after the Flood. Explain the relationship between Bible records of the Flood and physical records.
	After the Flood: The Physical Record	Describe physical records of the earth before, during, and after the Flood. Identify changes in the earth after the Flood. Explain the relationship between Bible records of the Flood and physical records.

Unit	Lesson Title	Lesson Objectives
7 RECORDS IN THE ROCK: FOSSILS		
	Fossil Formation	Describe characteristics of different fossil types Explain where fossils may be found
	Project S507A-Mold Fossil Copy	Create a copy of a fossil mold
	Project S507B-Cast Fossil Copy	Create a copy of a fossil mold
	Fossil Formation Part 2	Describe how petrified and carbonized fossils are formed Understand that fossils are the result of rapid burial
	Fossil Locations	Identify locations where fossils have been found
	Reading Fossils: Identification	Describe fossil identification procedures.
	Reading Fossils: Earth's Age	Understand that the earth is relatively young
	Project S507C-Plant and Animal Fossils	Draw a picture and write an article about a plant or animal group
	Reading Fossils: Difficulties	Identify difficulties in fossil identification Identify clues that can help identify fossils Describe how scientists use clues to make conclusions about fossils
	Project S507D-Fossil Clues	Identify clues for fossil identification
	Reading Fossils: Reconstruction	Describe how scientists reconstruct fossils
	Project S507E-Label the Skeleton	Use a skeleton to infer what an animal might have looked like
	Project S507F-Be Creative	"Reconstruct" a skeleton using bones of different animals
8 RECORDS IN ROCK: GEOLOGY		
	Features of the Earth	Describe the size and shape of the earth
	Project: Compare an Orange and the Earth	Examine the skin of an orange at two different distances Compare your observations to the appearance of the earth's surface
	Layers of the Earth	Describe the earth's layers
	Rocks on the Earth's Surface	Describe the rocks on the earth's surface
	Project S508B-Examine a Mineral	Examine the structure of salt using a magnifying glass
	Kinds of Rocks	Describe the different kinds of rocks
	Report S508C-Rocks	Research and write about a type of rock
	Project S508D-Rock Hunt	Complete an activity about rocks
	Changes in the Earth: Surface Change	Describe the forces that change the earth's surface Tell how the surface of the earth is changing Compare the structure of minerals in rocks and in their natural state
	Experiment S508E-Erosion Causes of Surface Change	Investigate the effect of running water on soil erosion Describe the forces that change the earth's surface Tell how the surface of the earth is changing
	Earthquakes and Volcanoes	Describe forces from under the surface of the earth
	Project S508F-Volcano Summary	Research and write a summary on a famous volcano
	Results of Forces	Understand that the earth is always changing

Unit	Lesson Title	Lesson Objectives
9 CYCLES IN NATURE		
	Properties of Matter	Identify the properties of matter Tell about the changes in matter
	Properties of Matter (Part 2)	Identify properties of matter Tell about the changes in matter
	Experiment S509A-Volume	Calculate the volume of an object using water displacement
	Changes in Matter	Compare physical and chemical changes Describe the three states of matter and how they are affected by temperature Identify common chemical changes
	Experiment: Water Container Experiment: Types of Changes	Compare the shape of water in different containers Compare physical and chemical changes using heat energy
	Conservation of Matter Experiment S509D-Conservation of Matter	Explain the law of conservation Make a prediction using prior knowledge Test the law of conservation of matter
	Structure of Matter	Explain the structure of matter
	The Four Seasons	Describe the four seasons
	The Cause of Seasons	Explain why seasons occur
	Project S509E-Globe	Use a model to determine why the earth has seasons
	Comets	Describe comets
	Report S509F-Famous Comets	Research and write about a comet
	Life	
	Experiment S509G-Water Evaporation	Investigate the effect of water temperature on rate of evaporation
	God's Order	Explain Bible accounts of God's order in creation.

10 LOOK AHEAD		
	Living Things: Plants, Fungi, Protists, and Monerans	Review the hierarchy of structure in an organism Review and describe the components of a plant cell Review how plants make their own food
	Living Things: Animals and Animal-Like Protists	Review common protozoa and invertebrates Review characteristics, life cycles, and reproduction of vertebrates
	Living Things: Balance of Nature The Earth: Records of Life	Review how all living things depend upon one another Explain geological records. Compare physical records and Biblical records of the earth's past.
	The Earth: Fossils	Review different types of fossil Review how fossils are formed
	The Earth: Records in Rock	Review Biblical records that explain the geological history of the earth
	Order in Creation Energy and Work Matter	Describe the balance of nature. Identify types of energy and work Review the structure and properties of matter Review physical change and chemical change Review cycles in nature

Science 600

Unit	Lesson Title	Lesson Objectives
1 PLANT SYSTEMS		
	Photosynthesis: Location	Identify parts of a leaf Identify the location of photosynthesis
	Experiment S601A-Anacharis Photosynthesis	Investigate the effect of light on photosynthesis
	Photosynthesis: The Leaf Factory	Identify the components and products of photosynthesis Describe how the carbon cycle affects photosynthesis Understand that only green plants can make food using photosynthesis
	Experiment S601B-Seeds	Investigate the effect of light on growth of a seed Investigate the effect of water on growth of a seed
	Photosynthesis: Products	Use an equation to represent photosynthesis Describe how glucose is used to make starch, fats, and proteins
	Experiment S601C-Digestive Enzymes	Investigate the effect of saliva enzymes on the digestion of starch
	Photosynthesis: Raw Materials	Identify the raw materials plants need for photosynthesis
	Investigation: Plant Growth	Identify the best light color for plant growth
	Transport System: Roots	Identify and describe parts of a root Describe how roots transport and store water and food
	Experiment S601D-Root Observation	Examine root hairs on a sprouting seed
	Transport System: Stems and Leaves	Identify parts of a stem
	Experiment S601E-Celery Regulatory System	Identify and describe parts of a leaf Observe the transport of water in a celery stalk Describe how natural plant chemicals help plants grow Describe how artificial chemicals affects plants
	Experiment S601F-Growing Roots	Observe the growth of a plant from a cutting

Unit	Lesson Title	Lesson Objectives
2 ANIMAL SYSTEMS		
	Digestive System: Structure	Identify organs in the digestive system Describe the process of digestion
	Digestive System: Function	Describe the role of the mouth in digestion Describe how food is passed from the mouth to the stomach
	Experiment S602A-Digestion Digestive System: Function (Part 2)	Describe the role of the stomach in digestion Observe the effect of rennin on digestion of milk Describe the role of the small intestines in digestion
	Experiment S602B-Oil and Soap Experiment S602C-Passing Food	Describe the role of the large intestines in digestion Create an emulsion using oil, water, and soap Compare the diffusion of sugar and starch across a semi-permeable membrane
	Circulatory System	Describe how the circulatory system functions Compare arteries, veins, and capillaries Compare red blood cells, white blood cells, and platelets Understand that blood can be used to diagnose health problems and diseases
	Experiment S602D-Pulse Rate Project S602E-Heart Excretory System	Investigate the effect of exercise on pulse rate Examine and research the heart Describe the structure and function of the excretory system
	Experiment S602F-Carbon Dioxide	Identify factors that can damage the lungs Identify health problems related to skin and kidneys Compare the amount of carbon dioxide in the air and in your breath
	Project S602G-Lungs Experiment S602H-Evaporation and Cooling	Examine and research the lungs Compare the rate of evaporation of water and alcohol
	Muscular System	Compare voluntary and involuntary muscles Describe the function and location of cardiac, striated, and smooth muscle
	Skeletal System	Describe and give examples of different types of joints Describe the function of bones Describe health problems that can affect muscles and bones

Unit	Lesson Title	Lesson Objectives
3 PLANTS AND ANIMAL BEHAVIOR		
	The Nervous System	Describe the structure and function of the nervous system Identify and describe the functions of the cerebrum, cerebellum, and medulla
	Report S603A-The Eye	Write about the structure and function of the eye
	Report S603B-The Ear	Write about the structure and function of the ear
	Nerves and Spinal Column	Describe the function of the spinal cord and nerves Identify and describe the structure of a neuron Identify the functions controlled by the ganglia and plexus
	Response and Intelligence	Compare and give examples of instinct, reflex, and learned response Describe three types of learned response Recognize man's superior intelligence over animals
	Report S603C-Instincts	Write about animal instincts
	Experiment S603D-Response	Teach a response to a goldfish
	Experiment S603E-Trial and Error	Investigate the effect of practice on performance
	Plant Behavior	Define and describe the different types of tropisms Describe the role of auxin in phototropism Describe the behavior of touch-sensitive plants
	Investigation: Tropisms	Predict the tropistic behavior of plants
	Terrestrial Biomes	Define biome Describe characteristics and locations of different terrestrial biomes
	Aquatic Biomes	Describe characteristics of aquatic biomes
	Food Chains	Define food chain Identify the role of producers, consumers, and decomposers in a food chain
	Nature: Cycles and Balance	Describe the carbon-hydrogen-oxygen cycle Define symbiosis and parasitism Give examples of how man affects nature
	Report S603G-Man's Influence	Write about an extinct or endangered animal

Unit	Lesson Title	Lesson Objectives
4 MOLECULAR GENETICS		
	Reproduction	Describe the reproductive structures of flowers in relation to inheritance in plants.
	Project S604A-Flower Structure Male-Female Reproduction	Dissect and examine the structure of a flower Compare mitosis and reduction division Understand that the number of chromosomes is halved during reductive division
	Project S604B-Lima Bean Embryo Inheritance	Dissect and examine the structure of a bean embryo Distinguish between dominance and recessiveness. Explain how many traits depend on multiple genes. Introduce the work of Gregor Mendel on genetic traits. Solve a Punnett Square and analyze the data.
	Project S604C-Mendel's Discovery	Examine the genetic characteristics of pea seeds Use a Punnett Square to predict offspring of pea plants
	Taste, Dominance, and Multiple Genes	Describe the function of taste buds Explain incomplete dominance Understand that many traits are controlled by more than one gene
	Experiment S604D-Taste Gene Lab	Investigate your genetic make-up for PTC taste
	Project S604E-Traits	Compare the frequency of dominant and recessive traits in a sample population
	DNA	Explain how genes and DNA transmit traits. Give examples of the use of hybrids and mutations that humans have selected for food provision. Give examples of the interaction between genes and the environment.
	Experiment S604F-Albinos Report S604G-Genetics Mutation	Investigate the frequency of albinism in seedlings Explain how genetics have improved plants or animals Understand that mutations do not add new genes Explain why mutations do not support evolutionary theory Describe albinism
	Project S604H-Seed or Seedless The Use of Mutations	Observe the results for the recessive gene of albinism. Describe how mutations are used to grow fruit
	Project S604I-Pea Pod Temperature Influence on Coloration	Observe the size of peas in a pod Give examples of the interaction between genes and the environment.

Unit	Lesson Title	Lesson Objectives
5 CHEMICAL STRUCTURE AND CHANGE		
	Chemical Structure	Define and give examples of matter and chemicals. Describe and give examples of the different states of matter.
	Experiment S605A-Solid, Liquid, Gas	Observe the physical properties of a solid, liquid, and gas
	Chemical Elements and Atoms	Compare properties of liquids and solids Distinguish between atoms and elements Compare three atomic models
	Molecules and Compounds	Define molecule and compound Give examples of common compounds
	Experiment S605B-Copper Iodide	Create a compound through a chemical change.
	Experiment S605C-Calcium Carbonate	Create a compound through a chemical change
	Periodic Table	Identify common chemical symbols Explain the structure of chemical formulas
	Project S605D-Water Molecule Model	Make a model of a water molecule
	Atomic Mass	Define atomic weight Define atomic number Calculate the number of neutrons using atomic number and atomic mass number
	Project S605E-Atomic Number	Calculate neutrons and electrons using atomic mass and atomic mass number
	Arrangement of the The Periodic Table	Identify the chemists who created the periodic table Compare atomic weight and atomic mass number Describe how the periodic table is arranged Define isotope
	Project S605F-Use the Periodic Table	Complete a chart of chemical symbols
	Chemical Change	Write the chemical formulas for some compounds. Identify acids and bases.
	Project S605G-Chart and Diagram	Create a diagram of an atom Interpret information from the Periodic Table
	Report S605H-Chemical Discoveries	Write about an important chemical discovery
	Acids and Bases	Compare the characteristics of acids and bases Describe how to test for acids and bases
	Experiment S605I-Acid or Base?	Use phenolphthalein to identify acidic, base, and neutral solutions
	Project S605J-From Memory	Type John 1:3 and Hebrews 3:4 from memory
	Project S605K-Cause and Effect	Identify cause and effect in chemistry
	Project S605L-Chemical Symbols	Identify chemical names by symbol Identify chemical symbols by name
	Project S605M-Discussion	Discuss and answer questions about chemistry

Unit	Lesson Title	Lesson Objectives
6 LIGHT AND SOUND		
	Waves: Sound	Name the source of all sound and tell how sound waves travel. Describe the parts of a sound wave and a light wave. Explain the difference between amplitude and pitch. Describe how sound waves are received by the ear. List some substances through which sound can travel and through which light can travel. Name the speeds of light and sound. Describe the electromagnetic spectrum.
	Experiment S606A-Test Tube Tunes	Investigate how the amount of water in a test tube and pitch are related
	Project S606B-Sound Vibrations Light Waves	Use a tuning fork to observe sound vibrations Compare the speeds of sound and light Describe how refraction and reflection affect light waves Compare how transparent, translucent, and opaque materials affect light waves
	Project S606C-Light Waves Project S606D-Refracted Light	Use a rope to model the structure of light waves Observe how refracted light can change the appearance of objects in water
	The Spectrum	Explain how Sir Isaac Newton discovered that sunlight is composed of colors. List the colors of sunlight's color spectrum in correct order.
	Project S606E-Color Spectrum Project S606F-Create a Rainbow Colors Project S606G-Color Wheel	Create the visible spectrum Create a rainbow using water Explain what makes things around us different colors. Make a color wheel Understand that white light contains all the colors in the spectrum
	Experiment S606H-Subtractive Colors	Create different colors using paper and cellophane Understand that objects absorb all colors except the color you see
	Experiment S606I-Mixing Colored Lights Mixing Colors	Create different colors using cellophane List the primary colors of sunlight and tell what color is produced when they are mixed. List the primary colors of pigments (colorants) and tell what colors are produced when they are mixed.
	Experiment S606J-Mixing Colorants	Create different colors using food coloring

Unit	Lesson Title	Lesson Objectives
7 MOTION AND ITS MEASUREMENT		
	Motion, Force, and Work	Define force Understand that work is done only when force moves and object
	Measurement of Work	Calculate work using force and distance Understand that the rate of work does not affect the amount of work done
	Experiment S607A Forces of Lifting and Pulling	Calculate work using a spring scale
	Project S607B Unscramble Activity	Review vocabulary words
	Power and Newton's Laws of Motion	Define and calculate power Describe horsepower
	Report S607C-Horsepower and Watts	Complete an activity on power
	Experiment S607D-Your Horsepower	Calculate the work done climbing stairs Calculate your horsepower
	Newton's Laws of Motion and Gravitation	List the three laws of motion and the Universal Law of Gravitation
	Experiment S607E-The Law of Inertia	Test the law of inertia
	Change in Motion	Understand that an object at rest will stay at rest unless acted on by an outside force Describe how friction affects work Explain the work principle Calculate the efficiency of a machine Give examples of machines that change the direction of motion

Unit	Lesson Title	Lesson Objectives
8 SPACESHIP EARTH		
	Earth's Motion	Describe earth's size and shape and its motion through space.
	Experiment S608A-Balloon Globe	Explain the seasons of the year and how they occur.
	Earth's Rotation	Explain how night and day occur on the earth.
	Time	Define the time zones on earth and be able to locate the prime meridian and the International Dateline.
	Experiment S608B-Observing Shadows	Observe how shadows change as a result of the earth's revolution.
	Earth's Orbit	Explain the seasons of the year and how they occur. Describe what happens when the vernal and autumnal equinoxes occur.
	Eclipses	Describe what happens during a solar eclipse and a lunar eclipse.
	Project S608C-Fact or Opinion	Identify statements as fact or opinion.
	Experiment S608D-Eclipses	Describe what happens during a solar eclipse and a lunar eclipse.
	The Solar System	Name and describe the main parts of our solar system. List the nine major bodies (including the dwarf planet) of our solar system from the sun outward and describe the relative size and composition of each body.
	Report S608E-Planets	Learn basic facts about the planets. Compare the surfaces of Venus and Mars.
	Asteroids, Comets, and Meteoroids	Define and describe some major characteristics of asteroids, comets, and meteoroids.

9 ASTRONOMY AND THE STARS		
	Astronomy	Define and describe the science of astronomy. Correctly interpret findings of astronomy in light of faith in God and His creation of the universe. Know some of the important people and events in the history of astronomy.
	Report S609A-Great Astronomers	Learn about important astronomers and their discoveries
	Astronomy Today	Describe some important developments occurring in astronomy today.
	Stars	Describe the composition of most stars. Describe how stars vary in color, size, temperature, and brightness.
	Elements and Spectra	Tell how spectra are used to investigate stars.
	Project S609B-The Spectroscope	Make a spectroscope Compare the spectra of different light sources
	Experiment S609C-Spectrography	Compare the spectra of different light sources
	Experiment S609D-Oil on Water	Observe the spectrum made by a natural prism
	Magnitude and Luminosity	Describe how stars vary in color, size, temperature, and brightness.
	Light Years and Astronomical Units	Define light-year and astronomical unit
	Constellations and Major Stars	Know and identify some major constellations and stars. Understand how the stars are used to determine location.
	Project S609E-Betelgeuse and Aldebaran	Rearrange the letters in Betelgeuse and Aldebaran to make new words
	Project S609F-Constellations	Draw the arrangement of stars in common constellations

Unit	Lesson Title	Lesson Objectives
10 THE EARTH AND THE UNIVERSE		
	The Photosynthesis System	Review the process, materials, and products of photosynthesis
	The Transport System of Plants	Review the transport and regulatory systems of plants
	The Digestive System	Review the organs and function of the digestive system
	The Excretory System	Review the organs and function of the excretory system
	Skeletal and Muscular Systems	Review the structure and function of the skeletal system Review the different types of muscle
	The Nervous System	Review the areas of the brain and structure of neurons
	Genetics and Reproduction	Discuss genetics and aspects of reproductive systems in plants and animals.
	Ecological Systems	Give some examples of biomes and cycles in nature.
	Report S610A-Biomes	Describe the conditions, plants, and animals of six terrestrial biomes
	Physics and Chemistry: Matter	Explain the nature of matter and relate the various particles to the structure of matter. Explain the main divisions of the Periodic Table of the Elements and identify common chemical symbols.
	Physics and Chemistry: Light	Explain the basic concepts of light and the ways that colors are produced.
	Physics and Chemistry: Sound	Explain how sound is produced and describe the characteristics of sound.
	Physics and Chemistry: Motion	Explain some basic components of motion such as force, work, laws of motion, and changes in motion.
	Physics and Chemistry: Machines	Explain some basic components of motion such as force, work, laws of motion, and changes in motion.
	Earth's Rotation	Describe the various motions of earth.
	Earth's Revolution	Describe the various motions of earth.
	Our Solar System	Name and describe the various parts of our Solar System. Name and describe the various parts of our Solar System. Identify important people, events, and observing equipment in the history of astronomy. Describe how stars differ and identify some of their main characteristics.

General Science I

Unit	Lesson Title	Lesson Objectives
1 WHAT IS SCIENCE?		
	Tools of a Scientist 1	Understand the purpose of science Identify three processes of scientific investigation List the five senses
	Tools of a Scientist 2	Identify the basic metric units for measurement. Identify the purpose and major categories of the classification systems
	Methods of a Scientist 1	Distinguish between inductive and deductive reasoning Describe and apply the first three steps of the scientific method Define Hypothesis
	Methods of a Scientist 2	Describe and apply the final steps of the scientific method
	The Scientist	Describe characteristics of a scientist List achievements of George Washington Carver
	The Four Major Areas of Science	List and describe the four major areas of science Give examples of the fields of science that fall under the four major areas
	Careers in Science	Explore professional careers in science.
2 PERCEIVING THINGS		
	Measurement: The Metric System	Identify how standard units are used for measurement in science Explain the advantages of the metric system List standard units and order metric system prefixes
	Measurement: Size and Distance	Identify the basic unit of length in the metric system Convert meters to millimeter, centimeters, and kilometers
	Measurement: Area	Identify the standard unit of area Calculate area using correct standard metric units and the formula: area = length x width.
	Measurement: Volume	Identify the standard units for volume of liquids and solids Calculate volume using the formula: volume = l x w x h Convert liters to milliliters and milliliters to cubic centimeters
	Measurement: Mass	Identify the standard unit for mass Distinguish between mass and weight Convert kilograms to grams, milliliters, and cubic centimeters
	Graphs: Uses, Bar, and Line	Understand and list the uses of graphs Identify the components of line and bar graphs Distinguish between independent and dependent variables Interpret the information given by a bar or line graph
	Graphs: Pictographs and Pie Charts	Understand the uses of pictorials and pie charts
	Experiment S702A-Making Graphs	Interpret information given in a pictorial or pie graph Design and draw three different graphs based on information given in tables

Unit	Lesson Title	Lesson Objectives
3 EARTH IN SPACE (PART 1)		
	Stargazing	Discuss what Scripture tells us about the sun, moon, and stars
	Star Charts	Distinguish between astrology and astronomy Describe the environs of our solar system Identify and apply the astronomers' unit of measure for calculating distances in the universe Identify the principal constellations of each season Utilize star charts to locate constellations Describe Aristotle's Geocentric theory and Ptolemy's modification
	Experiment S703A-Constellations	Identify characteristics of meteors and meteor showers Draw and construct a Zodiac Constellation Finder Chart the different constellations as they appear after sunset
	Astronomy	Identify basic features of the astrolabe Define and apply working definitions of altitude and azimuth
	Experiment S703B-Astrolabe	Identify key positions on the celestial sphere in relation to positions on earth Explain the impact of the scientific method on the Transparent Sphere Hypothesis Build an astrolabe Test the astrolabe by locating and recording positions of heavenly bodies Write a report of findings
	Astronomers	List the early astronomers and their contributions to Heliocentric theory Compare the positions of Copernicus and Ptolemy List important tools of the astronomer Identify parts of the telescope and distinguish between refracting and reflecting telescopes
altl4ess	Essay S703C-Galileo	Write a two-page report using references correctly

Unit	Lesson Title	Lesson Objectives
4 EARTH IN SPACE (PART 2)		
	The Sun's Energy	Identify the main source of energy for phenomena on the earth's surface List the four benefits of the sun State Einstein's Nuclear-fusion theory
	The Sun's Family	Differentiate between the inner and outer planets Identify defining characteristics of the terrestrial planets
	Outer Planets	Define retrograde motion and provide an example Identify the Jovian planets and some of their defining characteristics Distinguish between perihelion and aphelion Identify planet characteristics that do not support evolutionary theories of the origin of the solar system
	Asteroids and Comets	Identify defining characteristics of asteroids and comets Provide evidence about comets that supports a young solar system
	The Moon	Calculate weight on another planet's surface Identify characteristics of the orbit, phases and rotation of the moon
	Eclipses	Explain how the moon effects the tides Distinguish between a solar and lunar eclipse Identify characteristics of total and partial eclipses
5 THE ATMOSPHERE		
	Structure of the Atmosphere	Identify the primary gases found in the atmosphere Describe the function of the ozone layer Identify the five layers of the atmosphere
	Solar Effects	Describe the greenhouse effect Describe the role of the atmosphere in respiration and photosynthesis List ways in which the atmosphere protects mankind
	Experiment S705A-The Greenhouse	Construct a simple greenhouse
	Natural Cycles	Measure and record temperatures Summarize data List the steps of the water cycle Describe the two basic processes of life involved in the carbon-oxygen cycle Explain the processes of nitrogen fixation and denitrification in the nitrogen cycle Understand that all natural cycles are dependent on one another
	Pollution	Name the different types of pollutants found in the atmosphere Describe the effects of pollutants on humans, animals, and plants Recognize the responsibility of a Christian to help minimize pollution

Unit	Lesson Title	Lesson Objectives
6 WEATHER		
	Elements of Weather	Name the four elements of weather Identify the main causes of weather conditions Describe how a thermometer works.
	Wind	Identify the major causes of wind over various earth surfaces Describe the influence of the Coriolis effect on wind patterns Describe the general wind patterns on the earth Identify the role of the jet stream in weather prediction
	Pressure	List weather instruments together with their functions Identify the relationship between high and low pressure areas and weather conditions Define relative humidity
	Experiment S706A-Dew Point	Identify causes of rain, snow, sleet, and hail Define dew point Determine the dew point of the surrounding air Collect data and summarize findings
	Weather in Motion	List the four types of air masses Identify the three types of clouds
	Fronts	Identify weather conditions that produce fronts List the types of fronts List factors influencing the formation of thunderstorms, tornadoes, and hurricanes
	Weather Forecasting	Recognize the threat that storms pose to humans Identify the different means that meteorologists utilize to gather weather data Recognize the different symbols associated with weather maps Describe methods used in professional weather forecasting

7 CLIMATE		
	Climate: General	Compare and contrast weather and climate Review the four factors that affect weather and climate Understand how the four factors contribute to the long-term climate of a region
	Climate: Worldwide	Distinguish between latitude and longitude Identify how altitude and bodies of water affect climate List methods used to classify an area's climate
	Climate: Regional	List and describe the five basic climate areas. Identify the major climate areas and their defining characteristics
	Climate: Regional (Part 2)	Identify the major climate areas and their defining characteristics Assess the effects of the different climate areas across the continents

Unit	Lesson Title	Lesson Objectives
8 THE HUMAN ANATOMY (PART 1)		
	Human Building Blocks	Identify the structure of the typical cell Describe the basic functions of the cell
	Experiment S708A-Cheek Cell	Collect, observe, and describe cheek cells, guided by the video model Use science equipment and supplies according to instructions
	Human Framework	Summarize findings based on observations Explain the functions of the skeletal system List the muscle types together with their functions
	Skin	Identify some of the major bones of the skeletal system. Identify the three layers of the skin Explain the functions of the skin Identify reasons why people from around the world have different skin colors.
	Human Nervous System	Identify the 3 main parts of a neuron Describe how nerve impulses travel from one neuron to the next
	Project S708B-Human Brain	List vital functions of the spinal cord and the brain Conduct research of an interesting aspect of the brain using reliable sources Plan and write a five-hundred word report Use and cite references correctly
	Senses	Identify the five senses and the organs associated with each Describe the major parts and functions of the eyes, ears, and nose List the four tastes that are detected by the tongue.

Unit	Lesson Title	Lesson Objectives
9 THE HUMAN ANATOMY (PART 2)		
	The Respiratory System	Name the organs involved in the respiratory system Explain the functions of the organs involved in the respiratory system
	The Circulatory System	Identify the organs that make up the circulatory system Describe the structure and function of the heart List functions of the different blood vessels
	Experiment S709A-Heart Rate	Calculate heart rate using both abbreviated and standard methods Compare a resting heart rate to a rate following brief exercise
	The Digestive System--Part 1	Record data and summarize findings List the three functions of the digestive system Identify the parts of the digestive system and describe their functions
	The Digestive System--Part 2	Identify the parts of a tooth Describe the structure and the functions of the small and large intestine Discover how the liver, pancreas, and the gall bladder assist in digestion Trace the path a piece of food travels through the digestive system
	The Excretory System	Identify the main function of the excretory system Describe the structure and the functions of the kidneys, bladder, and skin as members of the excretory system
	The Endocrine System	Explain the purpose of the Endocrine system Describe the functions of the pituitary, thyroid, parathyroid, and adrenal glands

Unit	Lesson Title	Lesson Objectives
10 REVIEW		
	Scientists at Work	Review the steps of the scientific method Review the metric system
	Experiment S710A-Red Celery	Review the use of four different types of graphs and charts Perform an experiment following the scientific method Record and summarize their findings.
	Famous Scientists	Review famous Christian scientists and their discoveries Review contributions and scientists involved in astronomy
	The Astronomer at Work	Review contributions of scientists to meteorology/medicine Review the four constellations that are important to people in the Northern Hemisphere
	Planets	List the parts of the solar system List and review the planets in order Assess evidence of a comets lifespan for a young solar system Review the characteristics of and the phenomena caused by the moon Understand the importance of tools for the study of astronomy
	The Meteorologist at Work	Understand the importance of meteorology to different people and professions Review the structure of the atmosphere
	Studying the Weather	Recognize the two types of pollution Review the four components of weather and the instruments used to measure each Name and review the four types of air masses Understand how clouds are formed. Describe the three types Describe how fronts form and their effect on the weather Understand how meteorologists gather data for forecasting the weather
	Studying Climates	Differentiate weather and climate Review the global causes of climate Review the different classifications of climate
	The Medical Scientist at Work	Evaluate and explain the statement that "man is a marvelous product of intelligent design Review the components of the skeletal system Review the functions of the muscles Review the structure and functions of the skin
	Nervous and Endocrine Systems	Review the functions of the nerve cells, the brain and the spinal cord Review the five senses and the organs associated with each Review the functions of the various glands
	Circulatory and Respiration Systems	Understand and review the functions of the respiratory and the circulatory system Identify and describe the organs involved in the respiratory system Identify and describe the components of circulatory system
	Digestive and Excretory Systems	Explain how the digestive and excretory system work together Review the organs and functions of the organs associated with the digestive system Review the organs and the functions of the organs associated with the excretory system

General Science II

Unit	Lesson Title	Lesson Objectives
1 SCIENCE AND SOCIETY		
	Science Today	Define the term "science" Describe briefly the history of ancient and medieval scientists List the three renaissance scientists and their contributions
	Post-Renaissance Science	Evaluate the evolutionary theory as purposed by de LaMarck and Darwin and the implications it had on scientific research Recognize the contributions of John Dalton and Louis Pasteur
	Essay S801A-Mendel Today's Scientist	Name some modern scientists and their contributions Write an essay about Gregor Mendel List and describe the steps involved in the scientific method
	Science and Technology	State the four defined units of the metric system Write any numeral in scientific notation and change any scientific notation back to a numeral Determine the number of significant figures in a number Demonstrate the ability to add using significant figures Distinguish technology from pure science Provide examples of technology during ancient, medieval, renaissance, post-renaissance and modern times Recognize the importance of the invention of the printing press to the reading of Scripture
	Essay S801B-Da Vinci Limitations	Write an essay about Leonardo daVinci's inventions Examine the need for a moral guide, the Bible, as scientific knowledge increases Explore the goals today for technology in life science, physical science, and earth science List some of the difficulties and problems that technology is faced with in today's society

Unit	Lesson Title	Lesson Objectives
2 STRUCTURE OF MATTER (PART 1)		
	Properties of Matter (1)	<ul style="list-style-type: none"> Define and describe the two fundamental properties of all matter Describe the ways matter can be classified Explain how to use mass and volume to find the density of an object State Archimedes Principle Distinguish between boiling point and freezing point
	Experiment S802A-Determining Volume	<ul style="list-style-type: none"> Measure a common geometric shape in centimeters and record answers Calculate volume for the geometric shape Utilize the method of displacement to determine volume Answer questions and summarize results
	Experiment S802B-Metric Measurements	<ul style="list-style-type: none"> Utilize a balance to find mass Calculate volume from measurements Calculate density from data on mass and volume Read a Celsius thermometer
	Properties of Matter (2)	<ul style="list-style-type: none"> Explain what a chemical property is Identify the three states of matter Distinguish between crystalline and amorphous solids
	Atoms and Molecules	<ul style="list-style-type: none"> Discuss the contributions made by Dalton, Bohr, and Chadwick to the development of the atomic theory List the four major types of atomic particles and their properties
	Molecules	<ul style="list-style-type: none"> Define atomic mass (weight) Define molecules Describe how bonds are formed in molecules
	Elements	<ul style="list-style-type: none"> Explain the molecular model of matter Define element Examine how the periodic table is organized Calculate the number of electrons, protons, and neutrons in a given atom
	Compounds	<ul style="list-style-type: none"> Explain what a compound is and how it forms Analyze the use of chemical formulas to name a compound Interpret a chemical formula
	Mixtures	<ul style="list-style-type: none"> Define mixtures Provide an example of a mixture
	Experiment S802C-Mixtures	<ul style="list-style-type: none"> Utilize a filter to separate a mixture of sand and water Summarize your findings

Unit	Lesson Title	Lesson Objectives
3 STRUCTURE OF MATTER (PART 2)		
	Matter and Change	Describe and give an example of a physical change Explain the effects of heat on matter
	Experiment S803A-Phase Changes	Record the data Summarize your findings
	Solutions	Define soluble and insoluble Describe the processes of evaporation and condensation
	Chemical Changes	Distinguish between the heat of fusion and vaporization Distinguish between a physical and chemical change and provide an example of each List some indicators of a chemical change Explain the Law of Conservation of Mass Interpret a chemical equation Define and provide an example of oxidation
	Experiment S803B-Forms of Change	Determine the change as physical or chemical. Write a scientific report including the specifications given in the experiment. Write a scientific report including the specifications given in the experiment
	Nuclear Changes	Describe a nuclear change Differentiate between fission and fusion
	Acids	Describe properties common to all acids List some common acids Classify substances as weak or strong acids
	Bases	Define indicator and give an example Describe properties common to all bases List some common bases Provide an example of an indicator for a base
	Experiment S803C-Cabbage	Use indicator for each substance to determine if substance is an acid or a base Summarize results and the experimental method
	Salts	Describe a salt and provide examples Explain a neutralization reaction Explain what an electrolyte is
4 HEALTH AND NUTRITION		
	Foods and Digestion	List the six types of nutrients and provide examples of each Examine the purpose of each nutrient Trace the path food takes through the digestive system
	Diet	Examine the basis of the food pyramid and its design Provide examples from each level of the pyramid
	Experiment S804A-Food Record	Record your diet for a week utilizing the chart Write a description of the foods eaten in each category
	Nutritional Diseases	Discuss the use of chemicals in food production and their effects Examine the importance of healthy foods to a diet Describe symptoms of various vitamin deficiencies Evaluate the relationship between allergic reactions and addiction reactions
	Essay S804B-Nutrition Hygiene	Write an essay about nutrition Recognize the contributions of Louis Pasteur Identify the primary way to control contagious diseases Demonstrate knowledge of good hygiene Demonstrate knowledge of proper health maintenance

Unit	Lesson Title	Lesson Objectives
5 ENERGY (PART 1)		
	Mechanical Energy	Distinguish between kinetic and potential energy Compare force and work Define energy
	Potential Energy	Define potential energy Provide examples of objects possessing potential energy
	Other Forms of Energy	Explain how heat is produced by friction when work is done Distinguish between heat and temperature Describe the three processes that transfer heat Provide examples of objects that serve as good insulators
	Chemical Energy	Describe how chemical reactions are used to produce heat and electrical energy Provide examples of machines that convert chemical energy to mechanical energy
	Atomic Energy	State the Law of Conservation of Matter and Energy Recognize that mass is converted to energy in a nuclear reaction Describe the structure of the atom and its subatomic particles
	Energy Conversion and Entropy	Distinguish between fission and fusion Understand that in order to do work, energy must be converted from one form to another Discuss some common energy conversions Explain how generators convert mechanical energy to electricity Define entropy
	Essay S805A-Entropy	State the Second Law of Thermodynamics Write a report on the implications of entropy to a Christian

Unit	Lesson Title	Lesson Objectives
6 ENERGY (PART 2)		
	Magnetism	Discuss the history of magnetism List some materials that can exert magnetic fields Explain what is meant by a magnetic field and how to detect it
	Experiment S806A-Magnetism Electricity and Magnetism	Diagram the magnetic fields around the magnets Calculate the strength of a magnetic force if strength and distance are known Examine the use of electromagnets Explain what a superconductor is
	Electricity	List the three Electrostatic laws Explain the effects produced by the accumulation of a static electric charge
	Electrical Circuits	Compare simple electrical circuits to a valve water system Distinguish between direct current and alternating current List two factors that limit the amount of electric current that will flow through a simple circuit Utilize Ohm's law to calculate resistance in simple circuits List some uses of electricity
	Energy for the Future	Identify and describe the conventional energy sources Compare and contrast the characteristics, uses, and locations of coal, petroleum, and natural gas Identify and describe alternative energy sources Describe the various ways that solar energy is used Recognize that radioactive waste is the major problem associated with nuclear energy
	Experiment S806B-Hot Dog Cooker	Write a report on solar energy

Unit	Lesson Title	Lesson Objectives
7 MACHINES (PART 1)		
	Distance	Recognize problems associated with comparison measurement and the English system Understand that the SI system (metric system) is based on multiples of ten
	Essay S807A-Scientists Measuring Distance	Write a report on one of the Christian scientists listed List some tools used for direct measurement Define Global Positioning Systems Evaluate the use of scale drawings and geometry for indirect measurement Understand the application of geometry used in the examples
	Force	Define the terms force and gravity Recognize the contributions of Galileo and Newton to mathematics and science State Newton's three laws of motion and use them to explain how objects move
	Force Vectors	Distinguish between a scalar quantity and a vector quantity Explain the use of arrows to represent vectors Demonstrate how to draw a force vector Demonstrate how to add and subtract vectors
	Work	Define the terms work and joule Discuss James Joules' contribution to the field of physics Recognize situations when work is accomplished
	Work and Energy	Evaluate the relationship that exists between work and energy Understand the conversion from potential to kinetic energy and vice versa Define the term power Perform calculations to find power

Unit	Lesson Title	Lesson Objectives
8 MACHINES (PART 2)		
	Friction	Describe friction and its causes Identify when friction is helpful
	Types of Friction	Distinguish between starting and sliding friction Understand how friction is proportional to the "normal force"
	Experiment S808A-Friction Investigation	Calculate the coefficient of friction Describe strategies to reduce friction Calculate coefficient of friction for the matchbox
	Levers	Answer questions and summarize results Describe a lever and provide examples List the three things that machines are capable of doing Differentiate between Actual Mechanical Advantage and Ideal Mechanical Advantage
	Wheel and Axle, Pulleys, and Gears	Calculate efficiency of a machine using the formulas given Describe the wheel and axle and provide examples
	Experiment S808B-Pencil Sharpener	Describe the different pulleys and provide examples Describe gears and their uses Understand how to utilize the formulas for AMA, IMA, and efficiency for the wheel, axle, and pulleys Determine the AMA, IMA and efficiency of the pencil sharpener
	Inclined Plane, Wedge, and Screw	Describe the inclined plane and provide examples Calculate the AMA, IMA, and the efficiency of an inclined plane Describe the wedge and provide examples Describe the screw and provide examples

Unit	Lesson Title	Lesson Objectives
9 BALANCE IN NATURE		
	Photosynthesis and Food	Describe a basic leaf structure Explain how chlorophyll acts as a catalyst in plant cells Describe the function of the stomata Explain the two phases of photosynthesis
	Food	Discuss the history of food production and the importance of the Industrial Revolution to it Recognize the accomplishments of Gregor Mendel and Luther Burbank to the field of genetics
	Natural Cycles	Explain the process of nitrification by bacteria Understand the relationship between legumes and bacteria Understand the importance of bacteria and fungi to decay List some strategies for preventing decay
	The Water Cycle	Explain the water cycle on earth Differentiate between evaporation, precipitation, and transpiration Explain how photosynthesis and respiration are the basis of the carbon-oxygen cycle
	Balance and Disruption	Define Ecology Recognize the difference between habitat and community Explain what a food chain is Understand how natural controls work in a community Discuss the causes of ecological disruptions and provide examples
	Resources	Explain why proper agricultural and forestry practices are essential to the future of soil and forests Understand the importance of recycling Evaluate the use of alternative energy sources to conserve fossil fuels Recognize the causes of water and air pollution and strategies to correct them Discuss some negative impacts to wildlife and the wilderness caused humans

Unit	Lesson Title	Lesson Objectives
10 SCIENCE AND TECHNOLOGY		
	Basic Science	Recognize science and technology as a career choice Review the steps of the scientific method Understand the use and importance of the metric system to science
	Characteristics of Matter	Review the ways to classify matter by properties Review the four facts that describe matter Discuss the discovery of the atom and elements Understand the use of chemical symbols and formulas to denote elements and compounds Provide an example of a mixture and recognize that mixtures can be separated by physical means
	Matter in Change	Review physical changes and provide examples Review chemical changes and provide examples Distinguish an acid from a base
	Energy	Review potential, kinetic, and mechanical energy Recognize the relationship between heat energy and molecular motion Understand that most matter with the exception of water experience thermal expansion
	Chemical and Atomic Energy	Review the three types of heat transfer Review the First and Second Law of Thermodynamics Review the interpretation of a chemical equation Review the use of the atom for energy purposes and for destruction Discuss the pros and cons of using atomic (nuclear) energy Review entropy
	Magnetism and Electricity	Compare magnetism and electricity Review magnetic theory Understand how magnets and electromagnets are used Explain lightning as an example of static electricity Understand what current electricity is and its sources
	Machines at Work	Review how machines help us do work Provide examples of when friction is helpful and when it is harmful Describe the six types of simple machines and evaluate the mechanical advantage of each
	Life Science	Review the six essential nutrients and provide examples of each Review the food pyramid as an important guideline for a proper diet Understand that a nutritious diet and proper hygiene are preventative measures for disease and other illnesses Review photosynthesis Review the natural cycles common to the earth
	Vocations in Science and Technology	Explore and evaluate science and technology as possible avenues for a career Review and assess skills and areas of interest that they have Review desirable job application skills

Integrated Physics and Chemistry

Unit	Lesson Title	Lesson Objectives
1 - EXPLORATIONS IN PHYSICAL SCIENCE		
	What is Science?	Identify the major branches of science. Describe the difference between a scientific analysis and an opinion. Give examples of the types of things chemists and physicists do.
	The Scientific Method	State the steps in the scientific method. Note the two general types of research. Recognize a testable and falsifiable hypothesis.
	Experiment: Making Observations	Recognize a valid hypothesis. Make valid observations. Draw conclusions concerning what constitutes "good observations." Write a scientific report.
	The Metric System	Identify the units of measurement in the metric system. Convert between different units of measurement in the metric system.
	Scales	Recognize the smallest gradations on a scale. Use scales to arrive at precise measurements.
	Volume	Understand the concept of volume. Recognize the metric units of volume. Read data from a graduated cylinder. Measure volume using two different methods.
	Experiment: Determining Volume	Use geometric formulas to determine metric volume. Use water displacement to determine the volume of an irregular solid. Properly use and read data from a graduated cylinder. Present your findings in a scientific report.
	Mass and Density	Understand the concepts of mass and density. Recognize the metric units of mass. Read the scales of a triple beam balance. Calculate density.
	Experiment: Determining Density	Recognize the characteristics of density. Design and carry out a scientific investigation. Present your findings in a scientific report.
	Experiment: Density Column	Recognize the characteristics of density. Design and carry out a scientific investigation. Present your findings in a scientific report.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
2 - THE STRUCTURE OF MATTER		
	The History of Atomic Theory	Become familiar with some of the early concepts of the atom. Understand how technology can contribute to the understanding of scientific principles. Understand that models of the atom are based on empirical evidence and are revised as new information becomes available.
	Experiment: Atomic Structure	Investigate a scientific hypothesis. Present your findings in a scientific report.
	The Atomic Model	Recognize and describe the Bohr model of the atom. Recognize and describe the electron cloud model of the atom. Identify and define the subatomic particles. Describe the properties of the subatomic particles.
	Elements and Their Properties	List some physical and chemical properties of metals. List some physical and chemical properties of nonmetals. Describe and give an example of a metalloid.
	The Periodic Table	Learn about the development of the periodic table. Use information from periodic table entries to derive facts about the atoms of an element.
	Trends on the Periodic Table	Identify the major sections of the periodic table. List some of the elements in each section of the periodic table. Describe the traits of elements in each section of the periodic table.
	Experiment: Identifying an Unknown	Develop hypotheses concerning the identity of the metal under study. Follow procedures for determining density of a sample. Use data to determine the identity of a sample. Compare your conclusions to those of others and to your initial hypotheses. Discuss any flaws in the procedure that may have affected the results.
	Compounds	Differentiate between elements and compounds. Distinguish between the physical and chemical properties of compounds and those of the elements of which they are composed. Understand that compounds form as a result of bonding. State the law of definite proportions. Identify the number and types of atoms in a compound. Name a binary compound.
	Mixtures	Distinguish between pure substances and mixtures. Distinguish between homogeneous and heterogeneous mixtures. Recognize the various types of heterogeneous mixtures. Recognize the properties of homogeneous mixtures. Identify examples of homogeneous and heterogeneous mixtures.
	Separating Mixtures	Describe several methods of separating the components of a mixture.
	Experiment: Separating a Mixture	Identify and use the physical properties of substances to separate the components of a mixture.
	Review	Review topics discussed in this unit in preparation for the unit test. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
3 - MATTER AND CHANGE	States of Matter	Name the four states of matter. List the characteristics of each state of matter. Identify the energy changes that cause a substance to change states.
	Changes of State	Identify the relationship between the energy level within a substance and changes in temperature or state of matter. Describe the effect of energy levels within a substance upon the molecules of that substance. Determine how many calories of heat energy are needed to change the temperature, or state, of a sample.
	Experiment: Graphing Changes of State	Use your knowledge of changes of state to hypothesize how you will determine when the water sample is boiling. Observe and collect accurate data as the water changes state. Do a graphical analysis of data obtained during experimentation. Interpret graphical information with respect to changes of state and latent energy.
	Solutions—The Dissolving Process	Explain the chemical relationship between solutes and solvents that determines whether or not a solution will form. Describe the steps involved in the dissolving process. List some factors that increase the rate of solution.
	Acids and Bases	List some properties of acids and bases. Describe the chemical make-up of an acid and of a base. Understand and use the pH scale. Understand the use of indicators to analyze pH.
	Experiment: The Cabbage Indicator	Describe how indicators can be used to determine if a solution is an acid or a base.
	Chemical Bonding	Describe the three major types of chemical bonding. Explain how atoms enter into bonding situations. Understand that bonding creates new substances with different physical and chemical properties.
	Atomic Structure and Bonding	Determine the number of valence electrons in families 1, 2, and 13-18 on the periodic table. Relate the atomic structure of an atom to its bonding properties. Understand the concepts of exothermic and endothermic processes. Recognize signs of a chemical change.
	Experiment: Chemical Changes	Identify physical and chemical changes. Identify indicators of chemical change.
	Chemical Reactions and Conservation of Mass	Understand the purpose of a chemical equation. Perform an atomic inventory. State the law of conservation of mass. Identify a balanced equation.
	Types of Chemical Reactions	Recognize the various types of chemical reactions.
	Radioactivity	Describe the structure of the atomic nucleus. Identify the decay products of the nucleus.
	Nuclear Reactions	Predict the products of a nuclear decay reaction. Explain the concept of half-life.
	Experiment: Half-Life	Describe what is meant by the half-life of a radioactive element.
	Nuclear Energy	Describe the process of nuclear fusion. Describe the process of nuclear fission. Identify some applications for nuclear reactions. List positive and negative factors associated with nuclear reactions.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
4 - STATES OF MATTER		
	Properties of Solids	List some of the properties used to classify solids. Describe some of the differences between crystalline and amorphous solids. Describe how bonding patterns determine some of the properties of solids.
	Experiment: Comparing Hardness and Density of Solids	Describe how to test the hardness of a solid. Review and practice the procedure for testing the density of solids. Explain how to interpret a positive or negative correlation between graphed values.
	Elasticity and Strength in Solids	Identify properties and traits that determine a solid's elasticity and strength. Identify how the properties of elasticity and strength make various solids useful as different structural components.
	Electrical Conductivity in Solids	Describe the basic bonding structure of conductors and insulators. Describe materials as conductors, superconductors, semiconductors, or insulators. List some uses for conductors, superconductors, semiconductors, and insulators.
	Characteristics of Liquids	Define a liquid. State and describe some of the common characteristics of liquids.
	Experiment: Viscosity Pressure in Liquids	Compare and describe the viscosity of several liquids. Define pressure. Explain the difference between mass and weight. Give examples of phenomena that arise due to differences in pressure.
	Archimedes' Principle and Flotation	Explain how differences in pressure relate to buoyant force. State Archimedes' principle. List some applications of Archimedes' principle.
	Liquids and Capillary Action	Explain how surface tension and adhesive and cohesive forces contribute to capillary action. Explain why evaporation is necessary to move water up a tree.
	General Characteristics of Gases	Describe the motion of the particles in gases. Calculate the molecular weight of a substance. Describe some of the factors that determine the rate of diffusion in a gas. Become familiar with the statements of the kinetic molecular theory.
	Pressure and Volume in Gases	State the relationship between pressure and volume in a gas. Use Boyle's law to solve pressure/volume problems for gases.
	Experiment: Pressure in Gases	Collect and analyze data about the air pressure in the tires of a car. Compare experimental results with published data.
	Temperature and Volume Changes in Gases	State the relationship between temperature and volume in a gas. Use Charles's law to solve temperature-volume problems for gases. Understand the concept of absolute zero. Convert temperatures from Celsius to Kelvin. Describe the concept of an ideal gas and explain why it is useful.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
5 - MOTION AND FORCES		
	Distance and Displacement	Review the metric system. Understand and apply the concepts of distance and displacement. Work problems involving multiple displacements.
	Speed and Velocity	Explain the difference between speed and velocity. Understand that separate velocities can be combined. Work problems using the velocity formula.
	Acceleration	Describe acceleration and give examples from everyday life. Understand that a force must be applied to an object to cause acceleration. Apply formulas for acceleration.
	Motion Graphs	Review graphing techniques. Become familiar with and analyze various motion graphs. Determine the slope of a motion graph. Interpret the meaning of the slope of various motion graphs.
	Experiment: Motion Graphs	Design an experiment to determine the velocity of a battery-powered toy car. Perform an experiment to determine the type of motion experienced by a non-powered toy car traveling down a ramp. Make and interpret motion graphs.
	Momentum	Define momentum. Perform calculations using the momentum formula. Demonstrate an understanding of the law of conservation of momentum.
	Forces	Identify scientists who played a role in developing our understanding of motion. Understand that a force is a vector. Demonstrate how to use vector drawing to analyze forces.
	Friction	Distinguish between different types of friction. Explain the coefficient of friction and use it in friction calculations.
	Newton's Laws	State each of Newton's three laws. Recognize and give examples of each of Newton's laws. Use Newton's second law in calculations.
	Experiment: Propulsion	Describe the action and reaction forces in propulsion devices.
	Centripetal Force	Describe why an object is able to move in a circular path. List various sources of centripetal force. Do calculations using equations for centripetal force.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
7 - WORK AND ENERGY		
	Forms of Energy	Identify the two types of energy. Distinguish between renewable and non-renewable sources of energy. Describe several sources of energy.
	Work	Describe the relationship between work and energy. Do calculations using the equation for work.
	Mechanical Energy	Understand and state the relationship between mechanical, kinetic, and potential energy. Do calculations using the equations for kinetic and potential energy.
	Conservation of Energy	State the law of conservation of energy. Discuss how non-conservative energy transfers result in the reduction of useable energy. State the law of conservation of mechanical energy. Use the law of conservation of mechanical energy in calculations.
	Experiment: Conservation of Energy	Describe the relationship between the potential energy of an object and the amount of kinetic energy it can gain in a gravitational field. Describe how the kinetic energy of an object relates to the amount of mechanical energy it can transfer to another object. Describe how the amount of work done on an object relates to how far it moves.
	Power	Explain the relationship between work and power. Use the formula for power in calculations. State the metric unit for power.
	Simple Machines; Levers	Name the six simple machines. List the three ways that simple machines can make work easier. Describe and give examples of the three classes of levers. Use torque calculations to determine if a lever is balanced.
	Mechanical Advantage and Efficiency	Distinguish between the ideal and actual mechanical advantages for a simple machine. Understand the concept of efficiency and how it applies to simple machines. Describe factors that affect the efficiency of any machine. Use formulas to calculate IMA and efficiency.
	Pulleys; Wheels and Axles	Describe and give examples of pulley systems. Describe and give examples of wheel and axle systems. Calculate the IMA and efficiency of a pulley and a wheel and axle.
	Inclined Planes, Wedges, and Screws	Describe and give examples of an inclined plane, a wedge, and a screw. Calculate the IMA and efficiency for an inclined plane.
	Experiment: Inclined Planes	Understand the terms used to describe an inclined plane. Make measurements to calculate IMA, AMA, and efficiency.
	Review	Review topics discussed in this unit. Practice problem-solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
8 - HEAT FLOW		
	Thermodynamics and Entropy	State and give examples of the zeroth, first, and second laws of thermodynamics. Describe the changes that occur to the molecules of a substance due to heat flow. Explain why the total usable energy in the universe is decreasing.
	Specific Heat Capacity	Identify the relationship between heat flow and temperature differences. Explain the difference between total internal energy and temperature. Determine the relationship between the specific heat capacity of a substance and its mass and temperature when energy is absorbed.
	Heat Flow	Distinguish between and give examples of heat flow due to conduction, convection, and radiation. Understand why some materials are better insulators than others. Describe methods to increase the insulation value of a material.
	Experiment: Insulators	Build and use a calorimeter to measure rate of heat loss. Analyze data using comparative graphs.
	Heating Systems	Describe various home heating mechanisms. Distinguish between convection and radiation heating systems. Understand how local conditions affect the choice of heating systems.
	Experiment: Heat and Expansion	Observe the volume effects of heat absorption on liquid water. Observe the volume effect of heat loss as water changes from the liquid to solid state. Relate observations about thermal expansion to real world situations.
	Cooling and Refrigeration	Understand the usefulness of refrigeration. Understand the principles of the refrigeration cycle.
	Heat Engines	Understand the basic principles of thermodynamics that control the conversion of heat to mechanical energy. List and describe each step in the four-stroke engine cycle. Distinguish between and provide examples of internal and external combustion engines.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
9 - ELECTRICITY AND MAGNETISM		
	Electric Charges	Identify and describe the charge carriers in an atom. Describe how ions are made.
	Static Electricity	Understand the processes that cause objects to develop a static electric charge. State the laws of electrostatics. Use the inverse square relationship between force and charge separation to determine the relative force between charges at various separations. Know the basic precautions for lightning safety.
	Experiment: Electrostatic Investigations	Explain how to determine whether two objects have the same or different charges. Demonstrate that the distance between charged objects influences the behavior of those objects.
	Electric Current	Explain the difference between conductors and insulators. List the major factors that influence the conductivity of a wire. Explain how charges gain electric potential. Identify the parts of a complete circuit. Distinguish between direct and alternating current.
	Circuits	Understand that both voltage and resistance influence the amperage in a circuit. Use Ohm's law to determine circuit values for voltage, current, and resistance. Distinguish between series and parallel circuits. Explain why parallel circuitry is used in homes.
	Electrical Energy and Power	Do calculations using the formulas for power. Understand why electrical energy is delivered to homes on high voltage lines. Explain how electrical energy is used in various appliances.
	Magnetism	Identify several materials that are ferromagnetic. Distinguish between temporary and permanent magnets. Explain the concept of magnetic domains. Describe the properties of the magnetic field. Perform calculations relating the strength of the magnetic field and the distance to the magnet.
	Magnetism and Electricity	Summarize the experiments of Oersted, Ampere, and Faraday. Describe how to make a magnet from a conducting wire. Give examples of how electromagnets are used. Describe electromagnetic induction. Name some possible applications for electromagnetic induction.
	Experiment: Diverting a Magnetic Field	Collect data to determine what materials are useful in diverting magnetic fields.
	Magnetic Fields in Space	Explain the source of Earth's magnetic field. Give examples of why Earth's magnetic field is important. Explain why the Sun develops sunspots. Give examples of objects with magnetic fields other than the Sun and planets.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
10 - WAVES		
	Waves and Energy Transfer	Understand that waves transmit energy. Give examples of a medium. Distinguish between waves that require a medium and those that don't.
	Types of Waves	Identify the three basic wave forms and describe their motion. Give examples of the three basic wave forms in nature. Discuss the propagation of different wave forms through various types of media.
	Properties of Waves	Use a graph of wave motion to make predictions about the effect of the wave on the particles of a medium. Identify and define the various properties of waves. Describe how the properties of different wave types are perceived. List the physical properties that affect the speed of a wave in a given medium. Calculate the speed of a wave.
	Experiment: Changing the Speed of a Wave	Recognize the relationship between stiffness of the medium and the speed of a wave. Recognize the relationship between the density of the medium and the speed of a wave.
	The Behavior of Waves	Describe the behavior of a wave at the boundary between two media. Distinguish between reflection and refraction. Provide examples of reflection, refraction, and diffraction. Predict how two waves will interfere based on the principle of superposition.
	Sound Vibrations	Describe how sound is created. Understand that sound waves transmit energy. Explain sound waves in terms of pressure. Calculate the speed of sound in various media. Describe the relationship between the speed of sound and the temperature of a gas, such as air.
	Detecting Sound	Describe how the ear processes a sound wave. Explain the relationship between the frequency of a wave and pitch. Distinguish between auditory sound, infrasound, and ultrasound. Explain the relationship between the amplitude of a wave and loudness.
	Experiment: Using Vibrations to Produce Sound	Observe the transfer of vibrational energy from one object to another. Confirm that a vibrating object can create the sensation of sound. Describe how pitch can be changed in instruments that are tapped (percussion) or blown into (woodwinds and brasses).
	Doppler Effect	Explain the change in pitch observed when a sound passes by. Describe the relationship between the speed of sound and the creation of a sonic boom. List some practical applications of the Doppler effect.
	Beats, Resonance, and Harmonics	Describe the relationship between wave interference and the creation of beats. List some factors that determine the resonance frequency of an object. Explain the relationship between resonance frequencies and harmonics. Give some examples of resonance.
	Light and the Electromagnetic Spectrum	Explain why a prism is able to separate white light into its component colors. Describe some early experiments concerning the nature of light. Relate the frequency and wavelength of a given type of radiation to its energy. List some sources and applications of various types of electromagnetic radiation.

Unit	Lesson Title	Lesson Objectives
10 - WAVES - cont.		
	Properties of Light	Distinguish between luminous and illuminated objects. Give examples of materials that are transparent, opaque, and translucent to visible light. Determine the path of a reflected light ray. Describe the parts of the eye and explain how refraction helps to focus light. Explain the basic ideas that allow polarized sunglasses to reduce the amount of light that enters the eye.
	Reflection and Mirrors	Understand the differences between the absorption, reflection, or transmission of light. Describe the relationship between absorption, reflection, or transmission of light and color. Distinguish between plane, concave, and convex mirrors and provide examples of uses for each. Understand and interpret ray diagrams for mirrors.
	Experiment: Law of Reflection	Make observations and measurements to test the law of reflection. Analyze your results to determine accuracy.
	Lenses	Describe images formed by convex and concave lenses. Understand and interpret ray diagrams for convex and concave lenses. Provide examples of uses for convex and concave lenses.
	Review	Review topics discussed in this unit. Practice problem-solving techniques demonstrated in this unit.

Unit	Lesson Title	Lesson Objectives
11 - CHEMISTRY AND PHYSICS IN OUR WORLD		
	Carbon Dioxide and Global Warming	Identify which solar energies are transmitted, absorbed, or reflected by Earth's atmosphere. Describe the process that traps thermal energy in the atmosphere. List some of the exchanges in the carbon cycle. Explain the relationship between greenhouse gases and global warming. Discuss methods to reduce your carbon footprint.
	Experiment: Carbon Dioxide and Water Acidity	Relate levels of dissolved carbon dioxide to pH.
	Fossil Fuels' Effect on the Environment	Identify the contaminants that cause acid rain. List some of the outcomes of acid rain. Explain why increased amounts of atmospheric carbon dioxide lead to ocean acidification. List some of the outcomes of ocean acidification. Describe how smog is created and list some of the effects of smog.
	Experiment: Water Acidity and the Environment	Make observations to determine which types of materials are especially affected by acidic environments.
	Atomic Spectra and Moving Stars	Explain the process by which atoms produce light of unique quality. Describe how a spectrum can be analyzed to reveal the chemical make-up of a star. Distinguish between the various types of stars based on their spectral designation as O, B, A, F, G, K, or M. Explain how to use the spectrum of a star to determine its radial motion.
	The Temperature of Stars	Understand that all solid, opaque objects above absolute zero emit radiation. Review the Kelvin temperature scale. Use Wien's law to determine the temperature or peak intensity wavelength of a star.
	Kepler and the Motion of the Spheres	Give examples of how the study of astronomy was useful to ancient societies. Give examples of how the study of astronomy is useful in the present day. Distinguish between geocentric and heliocentric theories. List Kepler's three laws.
	Experiment: Kepler's Second Law	Carefully plot orbital data and draw conclusions based on the data.
	Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Biology

Unit	Lesson Title	Lesson Objectives
1 TAXONOMY: KEY TO ORGANIZATION		
	The History of Taxonomy	Define taxonomy Discuss the history of taxonomy Explain why Carolus Linnaeus is referred to as the "Father of Taxonomy" Define species
	Binomial Nomenclature	Understand the purpose of using Latin for binomial nomenclature Identify the two parts that make up the binomial name List the seven levels of classification
	Concept of Species	Differentiate between the two meanings of species Discuss the problems that taxonomy faces today
	Plant and Animal Classification	Develop an understanding of the use of a dichotomous taxonomic key Provide examples of characteristics a taxonomist may use in plant classification Provide examples of characteristic a taxonomist may use in animal classification Recognize the word endings in names given to the different taxa
	Experiment S1001A-Fruit Activity S1001B-Keying Plants Activity S1001C-Keying Animals	Utilize a plant key to classify a variety of fruits Select ten flowers to make a dichotomous key Select ten to twenty animals to construct a dichotomous key
	Search For A System	Using the five kingdom classification system, develop an understanding for the plant and animal kingdoms
	Taxonomy and Origins	Describe and differentiate between the Artificial and Natural Systems of Taxonomy Evaluate reasoning for using the five-kingdom system of taxonomy
	Models of Origin	Compare and contrast the Creation model and the Evolution model Evaluate the Creation model and the Evolution model using evidence
	Project S1001D-Research Project S1001E-Origins	Write a report on the origin of life Choose one of the following projects on origins

Unit	Lesson Title	Lesson Objectives
2 BASIS OF LIFE		
	Molecular Basis of Life	Identify the essential elements in living organisms Describe the structure of the atom Define atomic number and atomic mass Distinguish between molecules, diatomic molecules, compounds, and mixtures
	Properties of Compounds	Understand why elements combine Differentiate between cations and anions Describe an ionic bond and provide an example
	Experiment S1002A-Static Electricity	Perform an experiment of ionic bonding
	Covalent Bonding	Explain covalent bonding and provide an example Describe what a hydrogen bond is
	Experiment S1002B-Temperature Importance of Inorganic Compounds	Investigate water as a temperature control Discuss why water is the medium in which living processes occur Describe the actions of acids, bases, and salts when dissolved in water Distinguish between acids and bases
	Experiment S1002C-Water Properties	Investigate water as a solvent
	Experiment S1002D-Indicators	Determine acidity and basicity of common household products utilizing indicators
	Chemical Reactions	Distinguish between the four types of chemical reactions Explain the Law of Mass Action as it relates to chemical reactions Define activation energy Explain the effects of temperature on activation energy
	Organic Compounds	Distinguish between organic and inorganic compounds Identify the properties of carbon that explain its importance to life
	Carbohydrates	Explain why carbohydrates are important to living organisms Recognize the basic formula of a carbohydrate Distinguish between monosaccharides, disaccharides, and polysaccharides
	Experiment S1002E-Starch Lipids	Perform investigations for presence of starch or sugar Identify and describe the three types of lipids Recognize the vital functions of proteins to living organisms
	Nucleic Acids	Explain why the variety of amino acids contributes to the variety of proteins Distinguish between DNA and RNA Describe the structure of DNA and RNA
	Enzymes	Explain why enzymes are vital to living organisms Describe the action of enzymes in living organisms
	Experiment S1002F-Digestion	Perform investigations to explore the action of enzymes on digestion

Unit	Lesson Title	Lesson Objectives
3 CELLS		
	The Cell-An Introduction	Evaluate the two cell theories Recognize cells as basic building blocks of life Note differences between plant and animal cells
	Experiment S1004A-Cheek Cells	Prepare and observe a slide of cheek cells
	Experiment S1004B-Onion Cells	Prepare and observe a slide of onion cells
	Cell Design	Describe the structure of the plasma membrane Differentiate and describe the five methods of transport into and out of the cell
	Cell Membrane Function	Define osmosis Distinguish between the terms hypotonic, hypertonic, and isotonic
	Experiment S1004C-Osmosis	Perform an experiment about osmosis
	Organelles	Understand the process of glycolysis and the Krebs cycle for the production of ATP Describe the structure and function of the mitochondria as an organelle of the cell Discuss the function of a lysosome Identify where all energy is derived from
	Production of Needed Material	Provide a brief explanation of the structure and function of the endoplasmic reticulum, ribosomes, and the Golgi bodies
		Describe the structure and function of DNA found in the nuclei of cells Define and differentiate between mitosis and meiosis Distinguish the differences between plant and animal cells
	Cells in Organisms	List in order the five levels of cellular organization Recognize that, with each level, complexity increases Provide examples of specialized cells
	Experiment S1004D-Tissues	Observe several types of tissue cells using a microscope

Unit	Lesson Title	Lesson Objectives
4 CELL DIVISION AND REPRODUCTION		
	Cell Division	Identify the result of mitosis Recognize the purpose of mitosis
	Meiosis	Review the phases of meiosis Recognize the functions or purposes of meiosis
	Stages of Mitosis	Compare and contrast mitosis and meiosis Identify and describe the stages of mitosis Define cytokinesis List and describe factors that affect the rate of mitosis
	Experiment S1008A-Mitosis Asexual Reproduction	Observe slides of onion root and roundworm for mitosis Describe different means of asexual reproduction Discuss advantages of asexual reproduction
	Experiment S1008B-Fragmentation Plants	Perform an experiment of fragmentation on flatworms Define the terms vascular and propagation Describe the different types of asexual reproduction in stems and provide examples Explain the asexual reproduction in bulbs and adventitious roots
	Experiment S1008C-Bulb Structure Practical Applications in Plants	Using an onion, make observations of a bulb Describe and provide examples of methods used to grow plants asexually List the advantages of grafting
	Experiment S1008D-Cuttings Sexual Reproduction	Perform investigations of different types of cuttings Review sexual reproduction Discuss advantages of sexual reproduction
	Fertilization	Describe isogamy and isogametes Describe anisogamy and anisogametes Describe Oogamy and oogametes Explain fertilization and conjugation Distinguish the gametes producing organs in higher plants and animals
	Experiment S1008E-Sexual Reproduction Sexual Reproduction in Animals	Make observations of an egg cell and a sperm cell using prepared slides Distinguish between a haplontic and diplontic life cycle Describe internal and external fertilization Recognize the importance of cell differentiation
	Experiment S1008F-Tissue Structure	Observe different types of cells
	Metamorphosis	Describe and differentiate between complete and incomplete metamorphosis Provide examples of animals that undergo metamorphosis
	Sexual Reproduction in Plants	Describe the heteromorphic alternation of generations by plants Differentiate between sporophytes and gametophytes
	Life Cycles of Ferns and Pines	Study the life cycle of the fern Note the differences between the sporophyte and gametophyte generation Study the life cycle of the pine as a gymnosperm Note the differences between the sporophyte and gametophyte generations
	Experiment S1008G-Ferns and Pines	Prepare a slide of sporangia from a fern leaf and observe
	Experiment S1008H-Flowers	Examine a variety of flowers and identify the parts

Unit	Lesson Title	Lesson Objectives
5 GENETICS: GOD'S PLAN OF INHERITANCE		
	Genetics: God's Plan of Inheritance	Discuss the importance of Mendel's work and results that led to the principle of segregation and the principle of dominance and recessiveness. Identify the terms adopted to designate parents and generations. Distinguish between phenotype and genotype. Distinguish between heterozygous, homozygous and alleles.
	Probabilities	Recognize the relationship between random events and probability Understand the calculation of probability of independent events. Relate probability of events to Mendel's principle of segregation using the seed experiment.
	Experiment S1007A-Probability Cross Predictions	Perform an experiment on probability Understand the use of the Punnett square Explain a test cross and a dihybrid cross Review Mendel's principle of independent assortment
	Application of Mendelian Genetics	Describe the occurrence of incomplete dominance and provide an example Describe multiple alleles and provide an example
	Chromosome Basis of Heredity	Understand why Sutton used <i>Drosophila</i> to study genetics State Sutton's chromosome theory. Distinguish between the haploid and diploid condition of chromosomes. Define meiosis.
	Chromosomes in Meiosis	Identify and describe the stages of meiosis Distinguish the differences between spermatogenesis and oogenesis. Explain how crossing-over occurs
	Sex Chromosomes	Understand that the male chromosome is the sex determiner for most species Discuss the discovery of sex-linked inheritance and provide an example Explain how nondisjunction may occur and provide an example
	Molecular Genetics	Understand the one-gene-one-polypeptide concept and apply it to Mendel's studies on peas Explain how environment may modify or alter a gene Discuss how mutations occur and the possible effects of mutations
	Experiment S1007B-Molecular Genetics	Perform an experiment on molecular genetics
	Human Genetics	Analyze the problems associated with studying human genetics Examine the main methods used to study traits in humans
	Factors Studied	Explain how blood type is an example of both multiple alleles and incomplete dominance Recognize that differences in blood types occur among different nationalities
	Inherited Diseases	Discuss in detail the sex-linked trait of hemophilia Explain how sickle-cell anemia in Africa may be beneficial rather than harmful Describe abnormalities caused by disjunction of sex chromosomes Explain how Down's Syndrome and Turner Syndrome occur List common traits that are known to be inherited

Unit	Lesson Title	Lesson Objectives
6 MICROBIOLOGY		
	Microbial Taxonomy	Identify the five established kingdoms Differentiate between prokaryotes and eukaryotes Describe the basic characteristics common to bacteria Identify representatives of the Protista kingdom and their characteristics Identify representatives of the Fungi kingdom and their characteristics
	The Microscope	Discuss the history of the microscope Identify the different variations of light microscopes Understand why electron microscopes are used Learn the parts of the compound microscope
	Experiment S1003A-Microscope Protista: The Protozoa	Practice using a compound microscope Describe the structure of an amoeba Identify the characteristics of an amoeba Describe the structure of a paramecia Identify the characteristics of a paramecium
	Experiment S1003B-Protozoan Experiment S1003C-Amoeba	Prepare cultures and slides with pond water Utilizing a microscope and prepared slide, observe an amoeba
	Flagellated Protozoa	Describe the structure of an euglena Identify the basic characteristics of an euglena
	Experiment S1003D-The Euglena	Utilizing a microscope and prepared slide, observe an euglena
	Economic Significance of the Protozoa Protista: The Algae	Define parasite. Identify disease causing protozoa and describe the diseases they cause Recognize the variety and diversity of algae Describe characteristics common to green algae Describe characteristics common to golden-brown algae
	Experiment S1003E-Algae Project S1003F-Water Investigation Protista: Fire Algae	Prepare and observe cultures and slides of various algae Select a body of fresh water and make observations Describe representatives of fire algae Describe representatives of brown algae Describe representatives of red algae Recognize the significant economic contributions of algae
	The Fungi	Distinguish between saprophytes and parasites Describe general characteristics of fungi Recognize important uses of various fungi
	Experiment S1003G-Fungi The Monera	Observe a variety of fungi using a microscope or a hand lens Understand how bacteria are identified Recognize the commercial/economic importance of bacteria Distinguish between Gram-positive & Gram-negative bacteria Describe the characteristics of cyanobacteria
	The Rickettsias	Describe human diseases caused by rickettsias, and identify the vector Describe general characteristics of rickettsias Recognize the unique replication of viruses Understand that viruses are capable of causing several diseases
	Experiment S1003H-Algae Observations	Discuss how and why the first vaccination occurred Examine prepared slides of nostac and spirogyra

Unit	Lesson Title	Lesson Objectives
7 PLANTS: GREEN FACTORIES		
	How Is a Plant Made?	List the various jobs that cells are capable of Distinguish how plant cells are similar and different from other cells
	Parts of the Plant Cell	Explain the function of the nucleus and the two structures found in the nucleus Review the structure and function of the organelles found in the cytoplasm Describe the structure and function of the chloroplasts in the plant cell
	Anatomy and Morphology	Recognize the function of the cell wall in plant cells Understand how a tissue culture works Describe the special tissues in a plant List and describe the five plant organs Discuss the basic reproductive method Identify the flower parts
	How do Plants Grow?	Follow the seedling development of a bean Compare and contrast the structures of a monocot and a dicot
	Experiment S1005A-Seeds	Differentiate between an annual and a perennial Collect four different types of seeds and perform the investigation
	Developmental Anatomy	Explain germination of a seed Describe the elongation process of the root tip Discuss the differentiation of the plant cells Understand the process of increased girth in a plant
	How do Plants Work?	Define agronomy Discuss the history and men involved in the search for "how do plants grow?"
	Photosynthesis: A Closer Look	Understand and write the equation for photosynthesis Understand the importance of radioisotopes in discovering the processes of photosynthesis Distinguish between the light and dark reaction of photosynthesis List and describe factors that affect photosynthesis Recognize proteins are necessary for life to exist Understand the necessary components for the production of proteins by humans and animals
	Experiment S1005B-Terrarium Respiration	Construct a terrarium Define respiration and write the overall reaction Identify the life sustaining results obtained from respiration List and describe the changes that take place in the three stages of respiration
	How do Plants Help People?	Discuss briefly the history of crop production to meet demand Explain the green revolution that is taking place in the world

Unit	Lesson Title	Lesson Objectives
8 HUMAN ANATOMY AND PHYSIOLOGY		
	Digestive System	<p>Identify and describe the function of the organs of the digestive system</p> <p>Trace the path that food takes through the digestive system</p>
	Excretory System	<p>Explain the purpose of villi in the small intestine</p> <p>Explain the two common conditions that disturb the function of the bowels</p> <p>Identify the two systems involved in excretion of wastes</p> <p>Describe in detail the structure and function of the kidneys</p> <p>Recognize the importance of the kidneys</p>
	Respiratory System	<p>Differentiate between external and internal respiration</p> <p>Identify the function of the respiratory system</p> <p>Describe the structure and function of the organs involved in the respiratory system</p>
	Circulatory System	<p>Identify the functions of the circulatory system</p> <p>Distinguish between the solid and liquid portion of blood</p> <p>Describe the three groups of cells comprising the solid portion of blood</p> <p>Recognize anemia and hemophilia as disorder of the blood</p> <p>Understand the significance of blood types</p>
	The Heart	<p>Distinguish between the structures of the heart involved in pulmonary circulation and systemic circulation</p> <p>Trace the pathway blood circulates through heart, lungs, and body via the veins and arteries</p> <p>Understand blood pressure readings</p> <p>Recognize what the electrocardiogram is used for</p> <p>Identify and describe the function of the lymphatic system</p>
	Experiment S1006A-Heart Rate	Perform and experiment on heart rate
	Body Framework	<p>Identify the functions of the skeletal system</p> <p>Describe the structure of bones and cartilage</p> <p>Locate and identify the major bones in the body</p> <p>Provide examples of different kinds of joints</p> <p>Locate and identify parts of the teeth and mouth</p>
	Muscular System	<p>Describe the action and components of a muscle fiber</p> <p>Differentiate between the three muscle types</p> <p>Distinguish between a tendon and ligament</p> <p>Compare and contrast the movement of the skeletal muscles and the smooth muscles</p> <p>Identify disorders associated with the muscular system</p>
	Experiment S1006B-Muscle Types	Observe slides of the three muscle types
	Reproductive System	<p>Define sexual reproduction</p> <p>Discuss the development of a mature egg (ovum) in a female</p> <p>Discuss the production of sperm and semen in a male</p> <p>Explain what occurs during fertilization</p>
	Environmental Interactions	<p>Identify the divisions and functions of the nervous system</p> <p>Describe the basic structure of a nerve cell</p> <p>Identify and describe the different parts of the brain</p> <p>Understand the path of a reflex arc</p> <p>Differentiate between the parasympathetic and the sympathetic nervous system</p>

Unit	Lesson Title	Lesson Objectives
8 HUMAN ANATOMY AND PHYSIOLOGY - cont.		
	Sensory Systems: The Eye	<ul style="list-style-type: none"> Locate the structures of the eye Describe the functions of the structure of the eye Trace the path light takes upon entering the eye Describe common vision problems
	Sensory Systems: Hearing, Taste, Touch	<ul style="list-style-type: none"> Locate and describe the function of the three parts of the ear Recognize the location and the different tastes the tongue is capable of detecting Recognize the types of smells detected by the nose Distinguish between the five different receptors located in the skin Discuss common skin problems
	Endocrine System	<ul style="list-style-type: none"> Describe the location and function of the thyroid and parathyroid glands and the hormones they secrete Describe the hormonal control of the pancreas and adrenal glands Explain the release of hormones from the ovaries and testes Explain the relationship and the hormonal control of the pituitary and the hypothalamus Identify common diseases and conditions of the thyroid and the pancreas
	Immune System and Disease	<ul style="list-style-type: none"> Explain the three lines of defense a human body is capable of Explain why allergies occur List some major categories of disease

Unit	Lesson Title	Lesson Objectives
9 ECOLOGY, POLLUTION, AND ENERGY		
	Principles of Ecology	Define ecology Recognize what parts make an ecosystem State the principles of ecology using the ecosystem concept
	Environmental Factors	Identify the environmental factors that are important to habitats Recognize that the variety of habitats on earth are directly related to the variety of living things State the principles of ecology related to the environmental concept
	Food Chains	Recognize that organisms containing chlorophyll are the first link in the food chain State the principles of ecology using the food chain concept Evaluate the analogy of the balance of nature to a see-saw as an example of dynamic equilibrium State the principles of ecology using the balance of nature concept
	Ecological Relationships	List and describe the maps that ecologists use to define biomes
	Communities and Habitats	Explain how biomes are named by ecologists Explain the use of ERTS-I by ecologists Distinguish between the terms biosphere, biomes, habitats, and communities Recognize that when environments are mismanaged, the earth becomes less able to support life Understand the use of quadrats, transects, and inventories by ecologists for counting and sampling plants and animals Provide examples of endangered species
	Experiment S1009A-Habitats Experiment S1009B-Biomes	Select a habitat and set up a living community Explain what part of the ecosystem each living organism fulfills
	Experiment S1009C-Quadrats	Choose a quadrat location and count and list different plant and animal species in the quadrat
	Experiment S1009D-Inventory	Take an inventory of all the plants and animals in a designated area
	Pollution Affects Ecology	Understand the causes and effects of pollution in the environment
	Pollution Problems	Identify problems that create pollution Recognize the particles and chemicals that make up smog Discuss and demonstrate strategies that will help solve the pollution problem
	Energy Affects Ecology	Differentiate between potential and kinetic energy Identify and describe different forms of energy Recognize the problems associated with the burning of fossil fuels Understand the importance of energy conservation Recognize and describe alternative energy sources
	Essay S1009E-Stewardship	Locate Bible verses associated with our stewardship of the earth and rewrite each Bible verse using one's own interpretation

Unit	Lesson Title	Lesson Objectives
10 PRINCIPLES AND APPLICATIONS OF BIOLOGY		
	Study of Life	Discuss the harmony between science and Scripture State and describe the steps of the scientific method Identify limitations of the scientific method
	Definition of Life	Name common characteristics of living organisms
	Basic Principles of Life	Examine the levels of organization in living organisms Recognize that diversity is the reason for taxonomy Define and describe the term homeostasis
	Control System	Differentiate between the afferent and efferent pathways of a homeostatic control system Recognize the role of chemical transmitters Review the components of reproduction as growth and the new individual
	Environment of Life	Understand the many components of a food web Identify how energy flows through an ecosystem Describe ways that we can be good stewards of the earth
	Applications of Biology	Assess the possible solutions to genetic disease Explain genetic counseling Review microorganisms and some of the diseases they cause
	Green Revolution	Name three types of immunity Discuss how the world is addressing world hunger

Chemistry

Unit	Lesson Title	Lesson Objectives
1 MEASUREMENT AND ANALYSIS		
	An Introduction to Chemistry and Metric Measurement	Relate historic facts about the history of measurement
	Report S1101A-Metric System	Relate the common metric prefixes Convert between metric units of length using a "metric line"
	Measuring Volume in the Chemistry Laboratory	Research and describe the history of measurement and its impact on the advancement of science and societies Identify typical laboratory instruments used to measure volume
	Practice in Measuring Metric Volumes	Convert between cubic length measurements and other metric volume measurements Judge metric volume measurements in the 100 to 500 mL range to within +/- 20 mL. Feel confident using a graduated cylinder reliably
	Measuring Mass in the Chemistry Laboratory	Differentiate between mass and weight
	Showing Precision in Measurements	Convert between metric units of mass using a "metric line" Differentiate between accuracy and precision
	Project S1101B-Measuring Length with Precision	Determine how many digits should be in a measurement using any particular scale
	Experiment S1101C-Masses	Relate good laboratory procedures for measuring length, mass and volume Demonstrate proficiency in using a metric ruler to make precise measurements
	Observation and Hypothesizing	Demonstrate proficiency in using a centigram balance to make precise measurements
	Learning to Make Useful and Detailed Observations	Differentiate between qualitative and quantitative measurements Describe a good experimental methodology
	Using Graphs to Analyze Data	Recognize that valuable data in chemistry can be subtle and that careful and detailed observations are required Relate basic procedures for presenting a well defined graph
	Using Significant Figures to Show the Reliability of Data	Differentiate between graphs depicting direct and inverse relationships between variables Recognize and use basic equations for simple graphed lines Determine how many significant digits are in a measurement
	Using Scientific Notation with Significant Figures	Multiply and divide and apply significant digit rules to the answer Convert numbers into scientific notation
	Doing Chemistry Your Way: Find Your Future	Do mathematical operations with numbers in scientific notation while maintaining significant figure rules Demonstrate an awareness of the many opportunities in the career fields relating to chemistry

Unit	Lesson Title	Lesson Objectives
2 STARTING THE INVESTIGATION: HOW TO IDENTIFY ELEMENTS, COMPOUNDS, AND MIXTURES		
	The Basic Ingredient: Chemical Elements	Differentiate between physical and chemical properties Relate several facts from the development of chemical science
	Using Chemical and Physical Properties to Identify Substances	Know the symbols and spellings of the names of several common chemical elements Use the hardness scale to help identify an unknown substance Calculate density from direct and indirect measurements Use density measurements to help identify an unknown substance Identify a substance as organic or inorganic from its chemical formula
	Experiment S1102A-Observations of a Phase Change	Identify differences in energy content of various phases and how these can be visually demonstrated Interpret graphs produced from data collected during the phase change process Communicate conclusions
	Experiment S1102B-Salt and Sand	Differentiate between the physical properties of sand and salt Plan and implement an investigative procedure to separate the salt/sand mixture Communicate results
	Creating Compounds: Investigating Chemical Changes	Use the hardness scale to help identify an unknown substance Calculate density from direct and indirect measurements Use density measurements to help identify an unknown substance Identify a substance as organic or inorganic from its chemical formula
	Report S1102C-Density	Differentiate between materials based on their densities Plan and implement an investigative procedure to verify the identity of a substance based on its density Communicate results of the experiment and include a discussion of factors of a material that affect its density
	Experiment S1102D-Using the Tyndall Effect to Identify Colloids	Differentiate between a solution and a colloid based on the Tyndall Effect Clearly state the basis for the Tyndall Effect Communicate findings

Unit	Lesson Title	Lesson Objectives
3 EXPLORING LAWS FOR GASES AND CONSERVATION OF MASS		
	Nothing Stays Put - The Basis for Diffusion and Pressure	<p>Explain that the random motion of molecules causes the diffusion of gases</p> <p>State the relationship between the molecular weight of the diffusing material</p> <p>Define atomic weights as recorded on a periodic table</p> <p>Relate that pressure is created by collisions</p> <p>Understand that elastic collisions occurs without the loss of energy</p>
	Gases and Kinetic Molecular Theory	<p>Relate the basic ideas of the Kinetic Molecular Theory</p> <p>Read from a phase diagram chart</p> <p>Define and use the term "triple point"</p>
	Project S1103A-Graphing Kinetic Energy	<p>Apply the principles of Kinetic Molecular Theory to graphs of molecular motion</p>
	Pressure-Volume Relationships in Gases (Boyle's Law)	<p>State the inverse relationship between pressure and volume in an ideal gas</p> <p>Be familiar with common units for pressure</p> <p>Solve problems using Boyle's Law</p>
	Temperature-Volume Relationships in Gases (Charles' Law)	<p>Explain what temperature measures in a system</p> <p>Explain the concept of absolute zero and the Kelvin temperature scale</p> <p>Convert between Celsius and Kelvin temperature scales</p> <p>Solve problems using Charles' Law</p>
	Experiment S1103B-Finding Absolute Zero Experimentally	<p>To organize data onto a graph</p> <p>To better understand the concept of extrapolation</p> <p>Visualize the relationship between the temperature and volume of a gas</p> <p>To evaluate, make inferences, and predict trends from data</p> <p>Communicate findings</p>
	Project S1103C-Absolute Zero: Real or Theoretical?	<p>Use original sources to document findings concerning the research question</p> <p>Support your position with conclusions from research</p>
	Combined Gas Law	<p>Solve problems using the combined gas law</p> <p>Relate the values and meanings of "standard temperature and pressure"</p>
	Counting Gas Particles: The Measure of the Mole	<p>State Avogadro's Hypothesis</p> <p>Understand that Avogadro's number (which is equal to 1 mole of items) is determined by defining 1 mole as the number of atoms in exactly 12 grams of carbon-12</p> <p>Relate that the atomic mass of any substance (expressed in grams) contains one mole of atoms</p> <p>Relate that the molar volume of any gas at STP is 22.4 L</p>
	How Big is a Mole? Avogadro's Number	<p>Calculate the molecular or atomic weight (mass) of a substance from its chemical formula</p> <p>Determine the number of particles in a given mass of a substance and its chemical formula</p> <p>State the value of Avogadro's number as 6.02×10^{23} and know that this is equal to one mole of particles</p>

Unit	Lesson Title	Lesson Objectives
3 EXPLORING LAWS FOR GASES AND CONSERVATION OF MASS - cont.		
	Demonstrating Conservation of Mass with Balanced Equations	Relate the concept of conservation of mass
		Identify products and reactants in chemical equations
		Use coefficients to balance chemical equations
		Know how to calculate the masses of reactants and products in a chemical reaction from the masses of the reactants or products and the relevant atomic masses
	Essay S1103D-Biography	Research and describe the important contributions of investigators to the science of chemistry
	Examining the Use of Certain Gases as Propellants	Describe the sources and properties of specific gases important to ozone depletion reactions
		Understand the interaction of energy (sunlight) and matter (chemicals) in the stratosphere of Earth
	A Metal Can Meets Mr. Charles and Mr. Boyle	Describe experimental outcomes in terms of established laws
	How 'Gas Laws' Impact Scuba Diving	Describe practical outcomes of the application of gas laws in aquatic settings
	More 'Gas Laws' and Scuba Diving	Describe practical outcomes of the application of gas laws in aquatic settings

Unit	Lesson Title	Lesson Objectives
4 THE DISCOVERY OF ATOMS: NATURE'S BUILDING BLOCKS		
	The Golden Years of Chemistry	<p>Explain the early concept of the atom as described by Democritus</p> <p>Explain and apply the Law of Multiple Proportions as proposed by Dalton</p> <p>Relate the experimental basis for Thompson's discovery of the electron</p> <p>Relate the major contributions of the Curie's to the development of atomic theory</p>
	Experiment S1104A-Physical Properties of Elements	<p>Devise investigative procedures, selecting appropriate equipment and technology</p> <p>Form a testable hypothesis</p> <p>Collect, analyze and display results of investigative procedures</p>
	Experiment S1104B-Chemical Properties of Some Metals	<p>Communicate findings</p> <p>Form a testable hypothesis</p> <p>Collect, analyze and display results of investigative procedures</p>
	Masters of Classic Atomic Theory	<p>Communicate findings</p> <p>Relate the experimental basis for Rutherford's discovery of the nucleus describe the nucleus of the atom as being very small compared to the overall size of the atom but containing most of the mass</p> <p>Describe the particles and rays that are emitted from radioactive atoms</p> <p>Relate that Bohr's initial electron organizational atomic structure was determined by studying the spectra of simple atoms</p> <p>Determine the atomic number and number of electrons of an element given its atomic mass</p>
	Designing an Organizational Map: The Periodic Table	<p>Explain that Schrodinger extended the work of Bohr and deBroglie to develop the field of quantum mechanics</p> <p>Relate the position of an element in the periodic table to its atomic number and its atomic mass</p> <p>Use the periodic table to identify metals, metalloids, nonmetals, and noble gases</p> <p>Understand the difference in trends between groups and families</p> <p>Relate that the properties of an atom are mainly determined by the valence electrons</p>
	The Bohr Model Revisited	<p>Explain the concept of periodicity</p> <p>Explain that spectral lines are the result of energy released as electrons transition to lower energy levels and that the energy released is quantized</p> <p>Describe the filling order for the electrons of an atom in terms of level and sublevel</p> <p>Relate how many electrons each sublevel type (s,p,d,f) can accommodate</p>
	Charging Up: Ionization of Atoms	<p>Use the periodic table to identify trends in ionization energy</p> <p>Explain, based on properties of atoms, why periodic trends in ionization energy exist</p>

Unit	Lesson Title	Lesson Objectives
4 THE DISCOVERY OF ATOMS: NATURE'S BUILDING BLOCKS - cont.		
	A Closer Look Inside: Nuclear Reactions	<p>Explain the process of nuclear degeneration starting with parent nuclides and moving to daughter nuclides</p> <p>Explain and use the concept of half life to predict remaining activity of an original stock of radioactive material</p> <p>Realize that most common elements have naturally radioactive isotopes</p> <p>Understand that "binding energy" is the nuclear force that overcomes the electromagnetic repulsion of protons in the nucleus and holds it together</p> <p>State that the change in mass seen in nuclear reactions was predicted by Einstein in the equation $E = mc^2$</p> <p>Realize that the release of energy in a nuclear reaction (fission or fusion) is much larger than in a chemical reaction</p>
	Report S1104C-Fission Reactors	<p>Understand that alpha, beta, and gamma radiation produce different amounts and kinds of damage</p> <p>Understand that alpha, beta, and gamma radiation can be used to the benefit of mankind</p> <p>Balance nuclear equations</p> <p>Describe in detail the process of energy production in a nuclear reactor</p> <p>Document the use of nuclear reactors in this country and world-wide</p> <p>Evaluate the impact of this scientific advancement on societies and the environment</p>

Unit	Lesson Title	Lesson Objectives
5 MOLECULAR STRUCTURE		
	Chemical Accounting: Stoichiometry	Evaluate a balanced chemical reaction to determine the yield of a certain product given appropriate information (mass, number of moles, number of atoms) about the reactants
	Valence Structure	Understand that all chemical reactions proceed according to conservation of mass laws Determine how a particular atom will gain stability by gaining or losing valence electrons to obtain the noble gas (octet) structure Relate that it is the valence electrons that determine a material's chemical activity
	Determining Chemical Formulas	Use the concept of valence electrons to determine how atoms will combine to form stable compounds
	Electron Availability: Prelude to Bonding	Define ionization energy and relate its trends on the periodic table Define electronegativity and relate its trends on the periodic table
	Types of Chemical Bonds	Predict the type of bond that exists in a binary compound based on the class of element to which the anion and cation belong to (metal, nonmetal) Predict the type of bond that exists in a binary compound based on the relative values of electronegativities
	Polar Covalent Molecules and Dot Structures	Draw a dot structure of an element using its valence electrons
	Experiment S1105A-Demonstrating Polar Properties	Determine if a compound is polar based on symmetry Describe experimental outcomes in terms of molecular shape and polarity Apply ideas to the findings of other scientists

Unit	Lesson Title	Lesson Objectives
6 CHEMICAL REACTIONS, RATES AND EQUILIBRIUM		
	Evidence for Chemical Change	<p>Explain that energy is exchanged when bonds are broken and re-assembled</p> <p>Relate that temperature is a measure of the kinetic energy of a system</p> <p>Understand that enthalpy is a measure of the internal bonding energy of molecules and cannot be measured directly</p> <p>Distinguish between exothermic and endothermic processes given appropriate information in the balanced equation</p> <p>Give several indicators that suggest that a chemical reaction has occurred</p> <p>To better conceptualize various indicators for chemical change</p>
	Experiment S1106A-Observing Chemical Changes	To better conceptualize various indicators for chemical change
	Experiment S1106B-Chemical Reactions	Do this experiment
	Experiment S1106C-Ammonium Nitrate Enthalpy of Reaction	Do this investigation
	Using Gibbs Free Energy to Predict Spontaneous Reactions	<p>Determine the enthalpy of a reaction given a balanced chemical equation</p> <p>Determine if a reaction is exothermic or endothermic based on its enthalpy of reaction</p> <p>Describe comparative entropies of gases, liquids, and solids</p> <p>Use the Gibbs free energy equation to determine if a reaction will be spontaneous</p>
	Factors that Affect Reaction Rates: Solution Concentration	<p>Understand that reactions occur at different rates</p> <p>Determine mole fraction, molarity, molality, and percent solute of a solution</p>
	Experiment S1106D-Affect of Solution Concentration on Reaction Rate	<p>Devise investigative procedures, selecting appropriate equipment and technology</p> <p>Form a testable hypothesis</p> <p>Collect, analyze and display results of investigative procedures</p> <p>Observe how a trend in solution concentration for a specific solution affects reaction rate</p> <p>Communicate findings</p>
	Factors that Affect Reaction Rate: Temperature, Catalysts, Concentration of Reactants	<p>Understand that all reaction rates respond to changes in temperature</p> <p>Explain that all reactions require at least a small amount of activation energy</p> <p>Describe the use of catalysts to lower activation energy</p> <p>Understand that increasing reactant concentration increases reaction rate and, that in gases, this can affectively be caused by decreasing volume or raising the pressure</p>

Unit	Lesson Title	Lesson Objectives
6 CHEMICAL REACTIONS, RATES AND EQUILIBRIUM - cont.		
	Reaction Equilibriums and Equilibrium Constants	Understand that some reactions do not go "to completion" and instead enter into reversible reactions that occur at a constant rate between product and reactant Write an equilibrium expression from a balanced chemical equation Determine from the value of an equilibrium constant, whether reactants or products are favored
	Activity S1106E-Exploring Factors that Affect Equilibrium Conditions Affecting Equilibrium	Evaluate experimental results showing equilibria shifts due to temperature change Apply LeChatelier's Principle in cases where equilibrium is stressed by concentration, temperature, pressure or volume

Unit	Lesson Title	Lesson Objectives
7 EQUILIBRIUM SYSTEMS		
	Chemist's Toolbox	Solve problems concerning moles, gram formula weights, and balanced equations
	Solutions	Observe significant figure rules in all calculations Understand that solutions are homogeneous mixtures of two or more substances Relate that solutions can exist in three phases, solid, liquid or gaseous
	Solution Concentration: Molarity	Explain the relationship between the concentration of the solute in a solution and the freezing point depression or the boiling point elevation Calculate the concentration of the solute in terms of molarity
	Electrical Nature of Solutions	Make dilution calculations from original stock solutions Relate that acids, bases, and salts are three types of compounds that form electrolytes in solution
	Solubility	Understand that covalent compounds must both dissociate and ionize to form electrolytic solutions, whereas ionic compounds only need to dissociate Predict the number of ions a solute may contribute to a solution List factors that influence the solubility of a solute in a solvent
	The Dissolving Process	Describe the dissolving process at the molecular level
	Experiment S1107A-Solubility Trends	Form a testable hypothesis Collect, analyze and display results of investigative procedures Draw conclusions from experimental data concerning solubility trends Communicate findings
	The Solubility Constant	Write a solubility constant expression for a given solution process Predict from the value of a solubility constant if a solute is soluble or insoluble Understands how solubility is affected by the common ion effect
	Acid-Base Equilibria	State definitions and properties of acids and bases Understand that strong acids/bases fully dissociate while weak acids only partially dissociate Write an equilibrium constant (K_a or K_b) for the dissociation of an acid or base
	Experiment S1107B-Acid Strength	Form a testable hypothesis for what happens when HCl and marble interact based on a chemical reaction Determine how acid strength affects the speed and strength of the reaction Collect, analyze and display results of investigative procedures Communicate findings

Unit	Lesson Title	Lesson Objectives
7 EQUILIBRIUM SYSTEMS - cont.		
	pH Scale	Use the pH scale to characterize a solution as acidic, basic, or neutral Do calculations of pH from hydrogen ion or hydroxide ion concentration Relate that the ion product of water (K_w) is a constant equal to 10^{-14}
	Titration of Acids and Bases	Do calculations using the method of titration in determining the concentration of an unknown acid/base Understand that the process of neutralization leads to the formation of salt and water
	Redox Equilibria	Determine the oxidized and reduced species in a reaction Determine the oxidizing and reducing agent in a reaction
	Redox and Oxidation Potentials	Assign oxidation numbers to all members of a compound Understand that on the list of oxidation potentials, any reactant will act as an oxidizing agent for any agent above it
	Activity: Solution Concentration vs. Conductivity	Graph experimental data and interpret results for peer review
	pH Calculations	Perform pH calculations using a calculator

Unit	Lesson Title	Lesson Objectives
8 CARBON CHEMISTRY: HYDROCARBONS		
	Organic Compounds	Determine from its formula whether a compound is organic or inorganic Briefly describe the origin of petroleum products and some of its current uses
	Sources of Organic Compounds	List some sources natural sources of organic compounds and the major products from each Describe how fractional distillation is used to separate petroleum fractions
	Experiment S1108A-Volatility	Form a testable hypothesis concerning the relative volatility of the solvents being investigated Collect, analyze and display results of investigative procedures
	A Closer Look at the Carbon Atom	Do research to extend the application of these results to practical circumstances Communicate findings Describe the valence structure of carbon and how this influences its tendency to enter into covalent bonds Compare and contrast common carbon crystals, ie, diamond and graphite
	Bonding in Organic Compounds	Determine if a bond is likely to be ionic or covalent based on electronegativity differences
	Alkanes: Saturated Hydrocarbons	Use the naming system for the first ten compounds in the alkane series Understand the concept of structural isomers State that the most important chemical reaction of alkanes is combustion Relate that alkanes are chemically fairly unreactive Explain that saturated hydrocarbons have all carbons bonded to 4 other atoms
	Unsaturated Hydrocarbons	Relate that unsaturated hydrocarbons have fewer than 4 bonds to other atoms State that the family of hydrocarbons with double bonds is known as the alkenes State that the family of hydrocarbons with triple bonds is known as the alkynes Explain that unsaturated hydrocarbons are very reactive with the major reaction being an addition process which occurs at the site of the double or triple bond Relate the basic nature of cyclic compounds, such as benzene

Unit	Lesson Title	Lesson Objectives
9 CARBON CHEMISTRY: FUNCTIONAL GROUPS		
	Common Reactions of Saturated Hydrocarbons	Relate that substitution by halides is the most common reaction of saturated hydrocarbons other than combustion State the use of several organic halides which are important industrially or historically
	Reactions of Unsaturated Hydrocarbons	Explain that unsaturated chain hydrocarbons undergo addition reactions to become saturated Explain that aromatic hydrocarbons (benzene) undergoes substitution Relate that DDT is an important substituted aromatic hydrocarbon
	Alcohols	Recognize the hydroxyl functional group Explain the basic process by which alcohols are manufactured
	Aldehydes, Acids, and Ketones	Name several important industrial alcohols State that aldehydes contain the functional group -CHO, and formaldehyde is a common example of this class of chemicals State that the carboxylic acids contain the -COOH group and formic acid is a common example of this class of chemicals State that ketones contain the functional group C=O on one of the interior carbons and a common ketone is acetone
	Esters	State that the functional group of an ester is -COO- and play many roles in nature, including taste molecules Use the naming framework to derive a name for a particular ester
	Nitrogen Functional Groups	Explain that ammonia is manufactured using the Haber process State that the functional group of a primary amine is -NH ₂ , and list several uses of amines Use the naming framework to derive a name for a particular amine State that the functional group of amides is -CONH ₂ and explain that amides provide the structural link in proteins Use the naming framework to derive a name for a particular amide
	Proteins and Amino Acids	Explain that proteins are made by the polymerization of amino acids State that the condensation process joins amino acids in a peptide link to form proteins
	Experiment S1109A-Preparation of a Polymer	Evaluate scientific data Develop questions from an initial investigation

Unit	Lesson Title	Lesson Objectives
10 CHEMISTRY REVIEW		
	Measurement and Analysis	Review making metric conversions Review reading metric instruments to the proper degree of precision
	Scientific Analysis and Significant Figures	Review guidelines for good scientific methodology Review rules for manipulating significant figures Review rules for converting numbers to and from scientific notation
	Elements, Compounds, and Mixtures	Review examples of physical properties of substances such as density Review examples of chemical properties of substances such as combustion Review indicators to differentiate between various types of mixtures (solutions, colloids and suspensions)
	Gases and Moles	Review ideas pertaining to gases, Boyle's and Charles' Law, Avogadro's Hypothesis, Molecular Kinetic Theory Review solving problems using Boyle's and Charles' Law and the combined gas law Review calculating molecular weights Review solving molar mass problems based on balanced equations
	Atomic Structure and Nuclear Reactions	Review the basic structure of the atom Review information that can be determined about an atom from a periodic table entry Review the three natural forms of radiation that occur during the decay process and their inherent dangers Review balancing nuclear equations Review the significance of fission and fusion reactions
	The Periodic Law	Review the trends that occur on the periodic table such as ionization energy and electron affinity Review the idea that properties of families depend on valence electrons Review the labeling an atom's electronic structure at the sub-level (s,p,d,f) Review the concept that energy is released when electrons move from one energy level to a lower one
	Molecular Structure	Review determining the identity of an element from its electron configuration Review determining chemical formulas for compounds using information about the placement of an element on the periodic table Review the internal difference between different types of bonds, such as covalent, metallic and ionic Review the idea that unequal sharing of electrons causes covalent bonds to become polar
	Chemical Reactions, Rates, and Equilibrium	Review the concept of heat of enthalpy and determining exothermic and endothermic reactions Review recognizing signs that a chemical reaction has occurred

Unit	Lesson Title	Lesson Objectives
10 CHEMISTRY REVIEW - cont.		
	Reaction Dynamics	Review various methods for calculating solution concentration
		Review writing equilibrium constants from balanced equations
	Solutions	Review predicting what adjustment a system that is in equilibrium will make when stressed
		Review the relationship between the concentration of the solute and the freezing point depression or boiling point elevation of a solution
		Review making dilutions from an originally known solution concentration
		Review the concept that various factors influence more or less of the solute to dissolve
		Review the idea that some solutes make electrolytic solutions
	Solubility Equilibrium	Review how to interpret values of K_{sp} for a solution
		Review physical and chemical properties of acids and bases
	Neutralization	Review the relationship between the pH of a solution and the hydrogen ion concentration
		Review the significance of the ion product of water (K_w) and that it is always equal to 10^{-14}
		Review the idea that titration is often used to find concentration in an acid-base system
		Review the concept that acids and bases combine in a neutralization reaction to form water and salt
		Review determining which reactants undergo oxidation and which undergo reduction
	Organic Compounds	Review natural sources of carbon compounds
		Review naming patterns for saturated and unsaturated straight chain families (alkanes, alkenes and alkynes)
		Review the atomic structure of carbon that give it its unique bonding properties
	Hydrocarbon Chemistry	Review recognizing representatives of each of the major functional groups of hydrocarbons studied: halogenated hydrocarbons, alcohols, aldehydes, acids, ketones, esters, amines, and amides

Physics

Unit	Lesson Title	Lesson Objectives
1 KINEMATICS		
	Introduction to the Language of Physics	Do calculations using scientific notation. Make conversions within the metric system using dimensional analysis. Observe rules of significant figures when doing calculations involving measurements. Explain how the use of models, graphs, diagrams, and equations helps to analyze relationships and to understand physical concepts in physics. Recognize the constructs called 'fields' penetrating vast areas of space that can be mapped and studied and the effect of which can be measured.
	Experiment: Making a Soda Straw Balance	Plan, design, and troubleshoot a design for a sensitive balance for low-mass objects. Draw conclusions about the validity of the design, based on trial data comparing the accuracy of the machine to a standardized source.
	Experiment: Making a Simple Model of the Solar System	Construct a solar model to scale, using given measurements. Discuss the various challenges faced in designing models to explain particular phenomenon.
	Scalars and Vectors	Differentiate between scalars and vectors. Distinguish between displacement and distance.
	Experiment: Oleic Acid	Plan and implement an investigative procedure to determine the size of a molecule. Express measurements using scientific notation. Analyze the data and present your findings for peer review. Research and compare to previous findings. Communicate your results.
	Speed and Velocity	Differentiate between speed and velocity. Solve problems concerning average and instantaneous speed. Solve problems concerning velocity.
	Acceleration and Acceleration Due to Gravity	Determine the relationship between acceleration and velocity. Solve problems concerning straight line acceleration. Solve problems using equations for uniform acceleration. Determine the relationship between acceleration and gravity at the surface of the earth.
	Experiment: Determining Reaction Time	Use the free fall formula to solve for your reaction time. Average your results and compare them with those of your partner.
	Vectors	Differentiate between a scalar and a vector. Perform vector addition and subtraction using a graphical method. Utilize the Pythagorean theorem to calculate the magnitude and direction of a resultant vector. Resolve vectors into components using the sine and cosine functions. Perform vector addition on vectors that are not perpendicular.
	Projectiles	Recognize projectile motion. Describe the changes in the vertical and horizontal components of a projectile's velocity when air resistance is negligible. Resolve vectors into components and apply the kinematic equations to solve problems involving projectile motion. Recognize that air resistance does have an effect on projectiles in real life.

Unit	Lesson Title	Lesson Objectives
2 DYNAMICS		
	Newton's First and Second Laws	State that a force is required to cause an object to change its state of motion (Newton's First Law) Understand that when a force is applied an acceleration will occur (Newton's Second Law) Use Newton's Second Law ($F=ma$) to solve problems Solve problems concerning momentum and impulse
	Report S1202A-Isaac Newton	Research and describe the important contributions of investigators to the science of physics Indicate contributions that made an impact historically and how that science is still being used today
	Gravity	Explain that gravity is a field property generated by all objects with mass that can be quantified by an inverse square law known as Newton's Fourth Law, also known as the Universal Law of Gravitation
	Uniform Circular Motion	Explain that in centripetal acceleration and centripetal force, the vector is directed toward the center of the circular motion Use equations of centripetal acceleration and centripetal force to solve problems
	Experiment S1202B-Circular Motion	Test how well theory fits results as predicted by equations for centripetal motion Make and interpret graphs Make valid conclusions concerning the data
	Newton's Third Law and Conservation of Momentum	State that for every action force there is an equal and opposite reaction force (Newton's Third Law) Explain that the total momentum of a system is conserved Solve problems based on the idea of conservation of momentum
	Experiment S1202C-Explosion	Plan and implement an investigative procedure to verify the validity of the conservation of momentum laws Analyze data and present findings for peer review Research and compare to previous findings using similar mechanisms Communicate results
	Kepler's Laws of Planetary Motion	Relate the contributions of several planetary scientists to the development of the heliocentric theory Understand Kepler's first and second law conceptually Apply Kepler's third law mathematically
	Report S1202D-Solar System	Research and describe the important contributions of investigators to the science of physics Indicate contributions that made an impact historically and how that science is still being used today
	Experiment S1202E-Kepler's Law	Make measurements with precision using the data provided Analyze and evaluate to determine the validity of Kepler's Second Law Communicate findings

Unit	Lesson Title	Lesson Objectives
3 WORK AND ENERGY		
	Work, Kinetic, and Potential Energy	<p>Explain that work is a scalar quantity equal to the force applied to an object times the distance the object moves in the direction of that force</p> <p>Explain that work is a measure of energy expended</p> <p>State that kinetic energy is energy of motion and is equal to $\frac{1}{2}mv^2$</p> <p>State that there are many forms of potential energy and that gravitational potential energy is equal to mgh</p> <p>Solve problems involving work, kinetic and potential energy</p>
	Report S1203A-Nuclear Energy	<p>Evaluate the impact of scientific research and technology on society and the environment</p> <p>Describe connections between the various branches of science involved in the nuclear question (physics, chemistry, and biology)</p>
	Conservation of Energy	<p>Explain that total amount of energy in a system remains constant although energy may be transformed from one form to another within the system</p> <p>Solve problems based on the concept of conservation of energy</p>
	Power and Efficiency	<p>Explain that power is the rate at which work is done or energy is expended</p> <p>Solve problems using power equations</p> <p>State that machines can be rated according to their efficiency, which is a measure of the ratio of the work done compared to the energy applied</p> <p>Solve problems involving efficiency and related ratios, such as IMA and AMA</p>
	Experiment S1203B-Simple Machines	<p>Make quantitative observations and measurements with precision</p> <p>Analyze, evaluate and predict patterns from data</p> <p>Communicate findings</p>
	Heat Energy	<p>Explain that the amount of heat needed to change the temperature of one gram of a substance one degree Celsius is termed the specific heat of that substance</p> <p>Solve problems involving specific heat and calorimetry</p> <p>Understand that when sufficient heat is added to a sample it may change phase</p>
	Latent Heat	<p>State that there are four phases of matter</p> <p>Explain that latent heat is heat added to or removed from a system which causes a phase change with no change in the temperature of the system</p> <p>Solve problems involving latent heats</p>
	Experiment S1203C-Latent Heat	<p>Implement this procedure for determining the latent heat of fusion of water</p> <p>Collect data and make measurement with appropriate precision</p> <p>Analyze and evaluate data</p> <p>Compare data to referenced material</p> <p>Analyze procedure for sources of error</p> <p>Communicate findings for peer review</p>

Unit	Lesson Title	Lesson Objectives
3 WORK AND ENERGY - cont.		
	Laws of Thermodynamics	<p>State that the total amount of energy is constant but may be converted from one form to another (First Law of Thermodynamics)</p> <p>State that whenever energy is transformed from one form to another, some energy is dissipated as heat energy and cannot be transformed into mechanical energy (Second Law of Thermodynamics)</p> <p>Calculate efficiency in a heat engine</p>
4 INTRODUCTION TO WAVES		
	Characteristics of Waves	<p>Explain that pulses and series of pulses (waves) are a method of transferring energy</p> <p>Describe wave characteristics such as amplitude, velocity, wavelength and frequency</p> <p>Note that waves propagate in a variety of forms including longitudinal, transverse and torsional</p> <p>Solve problems concerning wave velocity using the knowledge that velocity equals wavelength times frequency</p>
	Experiment S1204A-Wave Speeds	<p>Make quantitative observations and measurements at the appropriate level of precision</p> <p>Analyze, evaluate and predict trends from data</p> <p>Communicate conclusions for peer review</p>
	Experiment S1204B-Pulses	<p>Formulate a testable hypothesis concerning how pulses transfer energy</p> <p>Make qualitative observations</p> <p>Analyze and predict trends from data</p> <p>Communicate conclusions</p>
	Wave Phenomena	<p>Describe wave characteristics such as reflection, refraction, diffraction and interference</p>
	Experiment S1204C-Waves	<p>Formulate a testable hypothesis concerning how waves will reflect from a barrier</p> <p>Make quantitative observations and measurements with appropriate precision</p> <p>Analyze and predict trends from data</p> <p>Communicate conclusions</p>
	Experiment S1204D-Bending Waves	<p>Make quantitative observations and measurements at the appropriate level of precision</p> <p>Analyze, evaluate and predict trends from data</p> <p>Communicate conclusions for peer review</p>
	Sound Waves	<p>Describe sound wave characteristics such as beats, resonance, the Doppler Effect and shock waves</p> <p>Explain that the speed of sound is dependent on the medium and the temperature</p> <p>Solve problems concerning beats, the Doppler Effect and the speed of sound</p>
	Experiment S1204E-Doppler Effect	<p>Make qualitative observations of a moving source producing regular pulses</p> <p>Communicate findings</p>

Unit	Lesson Title	Lesson Objectives
5	LIGHT	
	Speed of Light: Historical Calculations	Evaluate the impact of technology on the advance of scientific research Describe the contributions of Galileo, Roemer and Michelson to the calculation of the speed of light State that the speed of light is taken to be a constant 3.00×10^8 m/s in a vacuum
	Properties of Light	Describe properties of light such as reflection, refraction, polarization, dispersion and scattering Solve problems using the index of refraction of light with various media
	Experiment S1205A-Light Angles	Formulate a testable hypothesis Make quantitative observations and measurements at an appropriate level of precision Evaluate and predict trends from data Communicate conclusions for peer review
	Experiment S1205B-Water Refraction	Formulate a testable hypothesis concerning how light will refract as it enters the water medium and as it re-enters the air medium Make quantitative observations and measurements at an appropriate level of precision Analyze data to determine the index of refraction for water Research to compare results to established findings Communicate conclusions
	Mirrors	Understand the interaction of light with concave and convex mirrors Use ray diagrams to demonstrate the path of reflected light from a mirror
	Experiment S1205C-Convergence	Solve problems using the lens equation and its corollaries Formulate a testable hypothesis about how wave will behave as they meet each other in the water medium Make qualitative observations Evaluate results from data Communicate conclusions
	Lenses	Understand the interaction of light with concave and convex lenses Use ray diagrams to demonstrate the path of light through a lens
	Light Phenomena and Models of Light	Solve problems using the lens equation and its corollaries Explain the significance of the Young Two Slit experiment, the photoelectric effect, and the Taylor experiment to the definition of light Describe phenomena that characterize light as a wave and phenomena that characterize it as a particle
	Experiment S1205D-Light Observations	Make quantitative observations and measurements at an appropriate level of precision Analyze data to determine the width of a slit Communicate conclusions including a discussion of the reliability of the data

Unit	Lesson Title	Lesson Objectives
6 STATIC ELECTRICITY		
	Electric Charges	Describe the historical development of the understanding of electric charge as originating in the atom Differentiate between materials that are insulators and those that are conductors Understand that like charges repel and unlike charges attract
	Coulomb's Law	Recognize the significance of Coulomb's Law being in the format of an inverse square law State that the basic unit of charge is the coulomb and that the charge on a single electron is 1.6×10^{-19} Coulombs Use Coulomb's Law to solve problems
	Experiment S1206A-Static Electricity	Formulate a testable hypothesis concerning which materials donate electrons and which materials collect electrons Make qualitative observations and collect data Research to compare results to established findings Communicate findings
	The Transfer of Charges	Differentiate between a conductor and an insulator State that an electroscope is an instrument that is capable of measuring electric charge Realize that an object will become positively charged if it has a net loss of electrons
	Electric Fields	Understand that all electric charges produce an electric field around them State that, by convention, fields point in the direction a positive test charge would move if placed in the field Solve problems to determine field strength given appropriate data State that voltage is determined by the strength of the electric field between two parallel plates and the distance that separates them; $V = Ed$ Understand that natural electric fields exist that cause lightning discharges and account for low grade currents in seawater
	Electric Potential	State that Ohm's Law relates voltage, current and resistance; $V=IR$ Electric fields have units of volts/meter or newtons/coulomb
	Potential and Energy	When a charge moves through an electric field energy is expended and work is done Define capacitance Understand how charge is stored in a capacitor Solve problems concerning potential energy, capacitance and work Understand that a battery stores chemical energy that can continuously recharge a set of parallel plates to maintain the electric field between them, whereas a capacitor stores electrical energy and has a finite supply of electrons

Unit	Lesson Title	Lesson Objectives
7 ELECTRIC CURRENTS		
	Sources of EMF	<p>Realize that originally current was thought to be the flow of positive charges</p> <p>Understand that in an electric current, electrons flow from a source of high potential to an area of lower potential</p> <p>Understand that a source of electromotive force (emf), such as a battery or generator, must do work to raise electrons to a state of relatively high potential so that they, in turn, can do work</p>
	Project S1207A-Research and Report	<p>Research and describe the impact of early electrical theorists on the development of society, economics and technology</p>
	Fluid Flow	<p>Describe connections between the fields of physics, chemistry and biology having to do with this study</p> <p>Understand that conductance of a conduit is directly proportional to its cross-sectional area and inversely proportional to its length</p> <p>Solve problems concerning conductance</p> <p>Realize that if resistance to flow is too great, current will stop</p>
	Resistance	<p>Realize that electrical work is done only when electrons are forced by a source of emf against a resistance</p> <p>Understand that resistance is a function length, cross-sectional area, and resistivity (which is determined by the geometric electrical structure) of the resisting material</p> <p>State that conductance is the reciprocal of resistance</p> <p>Solve problems involving resistance and conductance</p>
	Ohm's Law	<p>Know that Ohm's Law relates voltage or source of EMF, current, and resistance; $V = IR$</p> <p>Use Ohm's Law to solve problems</p>
	Circuits	<p>Become familiar with symbols for simple circuit elements</p> <p>Differentiate between circuit diagrams of series and parallel circuits</p> <p>Understand that in series circuits, each resistor receives the same amount of current, but that the voltage drop at each resistor varies according to the magnitude of the resistance</p> <p>Understand that in parallel circuits, each resistor receives the same amount of voltage (that of the emf), but that the current received at each resistor varies according to the magnitude of the resistance</p> <p>Apply and solve problems using Ohm's Law to a series circuit</p> <p>Apply and solve problems using Ohm's Law to a parallel circuit</p> <p>Apply Watt's Law for power in both series and parallel circuits</p>

Unit	Lesson Title	Lesson Objectives
8 MAGNETISM		
	Fields and Forces	<p>Understand that a magnetic field has direction as defined by a test magnetic north pole</p> <p>Realize that the density of field lines is used to depict the strength of a magnetic field</p> <p>State that magnets always have two poles and that the field, by convention, flows out of the north pole and into the south in a continuous loop</p> <p>Understand that a current carrying wire creates a magnetic field which flows around the wire in a circle concentric with its circumference</p> <p>Realize that if a current carrying wire is coiled into a loop so that it forms a structure called a solenoid, that its magnetic field will be shaped similar to that of a bar magnet</p>
	Experiment S1208A-Magnetic Fields	Follow these directions and complete the activities
	Forces	<p>State that the magnitude of the force of attraction between two magnetic poles follows an inverse square law</p> <p>Understand that the force on a charge moving in a magnetic field depends on the magnitude of the charge, its velocity, and the direction in which the charge moves relative to the field direction</p> <p>Solve problems using the Biot-Savart force law: $F = qvB$</p> <p>Use the right hand rules to determine the direction of force on a moving charge in a magnetic field</p>
	Electromagnetism	<p>State that magnetic field strength is measured in teslas</p> <p>Understand that a moving charge creates a time-varying magnetic and electric field, which combined is referred to as an electromagnetic field</p> <p>Solve problems to determine the strength of the magnetic field around a current carrying long straight wire</p> <p>Use the right hand rule to determine the direction of the magnetic field around a current carrying long straight wire</p> <p>Realize that the magnetic fields in current carrying wires add as vectors</p> <p>Note that the magnetic field around a solenoid takes on the shape of a bar magnet. This is due to the vector addition of the magnetic fields of the current, which is carrying windings</p>
	Experiment S1208B-Magnetic Fields	Try this investigation to determine the shape of the magnetic field around a long, straight wire.

Unit	Lesson Title	Lesson Objectives
8 MAGNETISM - cont.		
	Electromagnetic Induction	<p>Understand that a changing magnetic field is required to cause a current to flow in a coil of wire and that this process is referred to as magnetic induction</p> <p>Recall that an emf is a source of electromotive potential or the ability to do electric work and is measured in volts</p> <p>Realize that an emf is induced in a coil of wire when it is in the vicinity of a changing magnetic flux or field density</p> <p>Understand that a transformer consists of two solenoids wound on the same core and is used to change the varying emf in the first solenoid into a different emf in the second solenoid</p> <p>Understand that a generator uses mechanical energy to rotate a loop made of conducting material through a magnetic field, so that an alternating current is induced in the loop as it changes position in the field</p>
	Electron Beams	<p>Understand the experimental process by which the charge to mass ratio for the electron was discovered</p> <p>State that in a cathode ray tube (CRT), electrons are accelerated in a beam by a "dropping" through a series of voltages</p> <p>Realize that the direction of the electron beam in a CRT is determined by the interplay of two magnetic fields that are perpendicular to each other which, in turn, control where the beam will hit the screen to produce an image</p>

Unit	Lesson Title	Lesson Objectives
9 ATOMIC AND NUCLEAR PHYSICS		
	Quantum Theory	<p>Understand and describe the photoelectric effect</p> <p>State that the photoelectric effect provides evidence for the quantum theory of light</p> <p>Use the photoelectric equation to solve problems</p> <p>Use Planck's equation to solve problems</p>
	X-Rays, Matter Waves, and the Uncertainty Principle	<p>Become familiar with Roentgen discovery of X-rays</p> <p>Understand that X-rays are produced when electrons are rapidly decelerated in the process of a collision with a metal</p> <p>Calculate X-ray energies</p> <p>Realize that an X-ray diffraction pattern can be used to determine the crystalline pattern of atomic spacing in a material</p> <p>Understand that matter has both wave and particle characteristics</p> <p>Determine the deBroglie wavelength of moving objects</p> <p>Understand the implications of the Heisenberg Uncertainty Principle and solve problems using it</p>
	Early Atomic Models	<p>Describe the Thomson Model of the atom</p> <p>Describe the importance of the Marsden-Geiger experiment</p> <p>Describe the Rutherford Model of the atom</p> <p>Explain the difference between the production and appearance of continuous, emission and adsorption spectra</p>
	Report S1209A-Early Atomic Physics	<p>Research and describe the impact of early atomic theorists on the development of society, economics and technology</p>
	Bohr Model	<p>State that Bohr's postulates assumed that the allowed electron orbits were definite and discrete</p> <p>Understand that the principal quantum number of an electron is a whole number and is an integral multiple of the number of wavelengths that will fit on a particular orbit circumference</p> <p>Calculate the orbital radius of electrons in the hydrogen atom</p> <p>Determine the velocity of a hydrogen electron in a particular orbit</p> <p>Realize that electrons in orbit about a positive nucleus possess both kinetic and potential energy</p> <p>Understand that energy is emitted from the atom in the form of electromagnetic radiation when an electron moves from a higher to lower energy level</p> <p>Calculate the total energy of an electron at a particular energy level</p> <p>Understand that the unique line spectra of each element is due to the discrete electron orbits allowed by the Bohr model and its modifications</p> <p>Calculate the wavelength of energy emitted during orbital transitions</p>

Unit	Lesson Title	Lesson Objectives
9 ATOMIC AND NUCLEAR PHYSICS - cont.		
	Nuclear Theory	<p>State that the atomic number is the number of protons in the atom</p> <p>Realize that the binding energy that holds the nucleons of the nucleus together results from a small loss of mass from those nucleons as that nucleus is composed and that this loss is called the mass defect</p> <p>Understand that the conversion of mass to binding energy in the nucleus was predicted in Einstein's equation, $E = mc^2$</p> <p>Solve problems concerning binding energy and mass defect</p>
	Nuclear Reactions	<p>State that unstable nuclei decay naturally by expelling gamma radiation, beta and alpha particles and that these unstable nuclei are considered "radioactive"</p> <p>Determine the half-life of radioactive materials</p> <p>Understand that electrostatic repulsive forces are longer ranged, but not as strong as nuclear attractive forces between protons</p> <p>Realize that the "Liquid Drop Model" helps to explain the interplay of electrostatic forces as a nucleus fissions</p> <p>State that when unstable nuclei fission, they do so with a loss of mass and that this mass is converted into energy</p>
	Fusion and Applications of Nuclear Energy	<p>Realize that fusion reactions in the sun join hydrogen atoms to create helium and the release of energy</p> <p>Understand that nuclear reactions of many types are useful in medical, biological, and physical science</p> <p>Understand the basic structure of a fission nuclear power plant</p>

Unit	Lesson Title	Lesson Objectives
10 REVIEW		
	Mechanics	Review ideas and solve problems concerning velocity and acceleration
	Dynamics	Review Newton's laws Review solving problems involving Newton's laws, gravity, impulse and momentum Review Kepler's laws
	Energy	Review solving problems involving Kepler's laws Review the concepts of kinetic and potential energy and solve problems concerning these ideas Review the concepts of power and efficiency and solve problems concerning these ideas
	Wave Motion	Review the various types of waves and wave phenomena Review solving problems using the wave equation
	Light and Sound	Review the wave properties of light Review the particle properties of light Review drawing ray diagrams to depict refraction and reflection of light Review the use of the lens formula for solving problems Review properties of sound and sound phenomena
	Electricity and Magnetism	Review the sources magnetic fields Review the sources and properties of charged particles
	Fields and Forces	Review the definition and properties of an electric field Review the use of Coulomb's Law to solve problems Review solving problems for magnetic field strength Review the electric field orientation in the two-plate capacitor and solving problems for work done by a capacitor
	Circuits	Review the process of magnetic field generation about a current-carrying wire and the shape this field acquires Review the use of the right hand rule for determining relative directions of magnetic force, velocity of a moving charge and direction of the magnetic field experienced by the moving charge Review induction and some of its applications Recall that if free electrons in a conductor have a source of emf and a closed path or circuit, they will flow as a current of electricity Recall that a circuit consists of a source of emf to supply voltage (or potential), a conductor through which current flows, and at least one resistor which receive the energy of the electrons Review the use of Ohm's Law to solve circuit problems Review the differences between series and parallel circuits Review solving problems for power in electric circuits

Unit	Lesson Title	Lesson Objectives
10 REVIEW - cont.		
	Modern Physics	<p>Review the history of atomic theory including the work of Thomson, Milliken, Rutherford, Geiger and Marsden</p> <p>Review the supporting spectral evidence for the planetary model of the atom first envisioned by Rutherford</p> <p>Review the refinements to the electron orbital structure called for by the experiments of Bohr, Plank, Hertz and Einstein</p>
	The Bohr Atom	<p>Recall features of the atomic model that support the particle theory of light</p> <p>Review how Bohr was able to show a correlation between the line spectrum for an element and his proposed model for the transition of electrons between energy levels</p> <p>Recall that the momentum of each energy level must be some multiple of Planck's constant</p> <p>Recall that the circumference of each energy level must be some integral multiple of the electron's deBroglie wavelength</p>
	Duality	<p>Recall that all moving objects produce waves called deBroglie waves whose wavelength are defined by the momentum of the particle</p> <p>Review the application and foundations of the Heisenberg Uncertainty Principle</p>
	Nuclear Energy	<p>Review the relationship between neutrons and isotopes of an element</p> <p>Review the relationship between mass defect and binding energy</p> <p>Recall the three natural decay products of an unstable nucleus, gamma rays, alpha and beta particles and some of their effects</p> <p>Review the half-life calculation for radioactive isotopes</p>