

Science 300

Unit 1: YOU GROW AND CHANGE

Lesson Title	Objective
Your Body Breathes Air	Describe how air enters the body Understand that the body needs air
The Body Needs Oxygen	Understand that animals need oxygen to live
Experiment: Breathing Patterns	Understand that the body needs oxygen Measure breathing patterns
Experiment: Your Lungs	Feel how lungs move during breathing
Your Body Digests Food	Describe how food moves through the digestive system
Experiment: Taste Test	Compare how foods pass through a paper towel
Your Body Exercises and Rests	Describe how bones help the body Understand that muscles and bones are important Describe how the heart and diaphragm work
Experiment: Taking Your Pulse	Understand that a pulse tells how fast the heart is beating Practice taking a pulse
Project: Bone Numbers	Understand that the body is made of many bones
Your Body is Different from an Animal	Describe the differences between humans and animals

Unit 2: PLANTS

Lesson Title	Objective
Plant Parts	List the plant parts that store food Describe the jobs of roots, stems, and leaves
Experiment: Root Hairs	Study root hairs on a plant
Experiment: Study a Stem	Study the stem of a plant
Plant Growth	List the things plants need to grow Explain how plants get carbon dioxide
Experiment: Grow Some Plants	Test how light affects plant growth
Plant Changes	List four ways plants can grow Understand that plants grow and change in different ways
Experiment: Watch Bean Seeds Grow	Understand that plants come from seeds List the things seeds need to grow
Experiment: Plant a Piece of Potato	Study the growth of a potato plant
Experiment: Bean Plant	Study the growth of a bean plant Understand that some parts of a plant grow faster than other parts

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Unit 3: ANIMALS: GROWTH AND CHANGE

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

Unit 4: YOU ARE WHAT YOU EAT

Lesson Title	Objective
How to Build a Healthy Body	Use My Plate to categorize common foods Describe how food helps the body
How to Build a Healthy Body-2	Compare healthy and unhealthy foods
How to Plan for Healthy Eating	List healthy food choices for breakfast, lunch, snack, and dinner
Project: Breakfast Chart	Understand that the body needs foods from each group Track the foods you eat for breakfast
Project: Lunch Chart	Track the foods you eat for lunch Understand that the body needs foods from each group Understand that the body needs foods from each group Track the foods you eat for dinner
Project: Chart Totals	Understand that the body needs foods from each group Total the foods you ate for breakfast, lunch, and dinner
How to Form Good Health Habits	Describe healthy dental habits
Caring for the Eyes and Body	Describe healthy habits for the body and eyes

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Unit 5: PROPERTIES OF MATTER

Lesson Title	Objective
Chemistry and Robert Boyle	Understand that chemists study matter Identify Robert Boyle as a famous chemist
Experiment: Be a Chemist	Experiment with matter
Properties of Matter	Define matter Understand that all matter has volume and mass Describe properties of common items
Experiment: Think about Mass	Understand that objects can have different weights and masses
Experiment: Is Air Matter?	Test the mass of air
Project: Matter List	List different types of matter
Experiment: 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: Mass Measurement	Compare the mass of matter in different states
Experiment: Melting Ice Cubes	Study how temperature affects ice cubes
Chemical Changes	Give examples of chemical change Understand that matter is made of tiny atoms and molecules

Unit 6: SOUNDS AND YOU

Lesson Title	Objective
Sounds are Made	Understand that sound is made from vibrations Give examples of objects that make sound
Experiment: 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 how vocal sounds are made Describe the different vibrations made by high and low sounds
Experiment: Sound Patterns	Understand that sound can travel through things
Report: Read and Write About Sound	Write about sound
Experiment: High and Low Sounds	Study how vibration speed affects sound
Experiment: Loud or Soft?	Experiment with sound vibrations from a coffee can
Sounds are Heard	Describe how the ear hears sound
Experiment: Think About Hearing	Compare how well sounds are heard
Report: How Animals Hear	Write about animal hearing

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Unit 7: TIME AND SEASONS

Lesson Title	Objective
How the Earth Moves	Explain why the sun appears to move in the sky Define rotation and revolution
Experiment: The Earth	Understand that it can not be light all over the earth at once
Experiment: Night	Understand that when one side of the earth is light the other side is dark
Experiment: The Earth's Rotation	Use a clay model to learn about the earth
Why Time Changes	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 Identify the length of time in a day, year, and leap year
Experiment: Different Times	Understand that it is day during different times around the world
Report: Months	Write about how months got their names
Why Seasons Change	Explain the difference in weather during summer and winter Understand that seasons are caused by the tilt of the earth's axis Compare the seasons of the Northern and Southern hemispheres

Unit 8: ROCKS AND THEIR CHANGE

Lesson Title	Objective
How Rocks are Formed: By Heat	Describe how igneous rocks are formed Identify the three layers of the earth Understand that the earth is made of rock
Rocks Formed by Volcanoes	Give examples of past volcanic eruptions Describe igneous rocks are formed
How Rocks are Formed: By Pressure	Describe how metamorphic rocks are formed Describe how sedimentary rocks are formed Understand that rocks are made of tiny crystals called minerals
Experiment: Bubbling Grains of Rock	Watch how vinegar reacts with limestone
Rocks are Changed by Wind and Water	Understand that wind can wear away rock Understand that water carries rocks and soil to different places
Rocks are Changed by Heat and Plants	Describe how plants can break rocks Describe how heat and cold can break rocks
Rocks are Used for Building	Describe how marble, granite, limestone, and gems are used
Report: Mount Rushmore	Write about Mount Rushmore
Rocks are Used for Enjoyment	Explain how to collect rocks Understand that gems are rare and valuable rocks

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Unit 9: HEAT ENERGY

Lesson Title	Objective
Heat Energy (Part 1)	List the things fire needs to burn Identify five sources of heat Define friction
Experiment: Feeling Friction	Use friction to create heat
Experiment: Oxygen and Fire	Understand that fire needs oxygen to burn
Heat Energy (Part 2)	Identify the sun as the primary source of heat on earth Describe how electricity is created and used for heat Explain the effect of color on light absorption
Experiment: 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: Water Molecules	Understand that water molecules move faster in hot water
Movement of Heat Energy	Understand that heat causes gas to expand and rise Describe how heat moves by radiation, conduction, and convection
Experiment: 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

Unit 10: REVIEW

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

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Unit 1: PLANTS

Lesson Title	Objective
Plant Life	Understand that plants are living things that grow Compare living and non-living things
Plants Used As Food and Shelter	List examples of foods that come from plants Describe how plants are used for shelter Describe how plants are used for food
Project: Things Made of Wood	List objects made of wood
Report: Read and Write	Write about fruit grown in another country
Plants Used For Enjoyment and Symbols	Understand that plants are used as state symbols Understand that plants can be enjoyed
Report: Flowers as State Symbols	List state flowers
Report: Flower Paragraph	Write about a state flower
Parts of Plants	Identify the main parts of a plant Describe the jobs of roots, stems, leaves, and flowers
How Plant Parts Function	Describe how roots and root hairs function Describe how plant stems function
Experiment: Celery	Understand that tubes in plant stems carry water to the leaves
How Plant Parts Function (Part 2)	Describe photosynthesis and identify the materials needed to complete the process Understand that when leaves decay they return nutrients to the soil Identify two important functions of leaves
How Plant Parts Function (Part 3)	Identify parts of a flower Explain why flowers are important

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Unit 2: ANIMALS

Lesson Title	Objective
How Animals are Structured	Explain the difference between vertebrates and invertebrates Describe characteristics of elephants Describe characteristics of fish, reptiles, birds, and mammals
Whales	Describe characteristics of whales Identify the largest mammal and largest land mammal
Report: 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 Describe characteristics of fish
Report: Writing about Fish	Write about fish
Project: 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	Calculate temperature using cricket chirps Describe the behavior of bees and crickets
Report: Honeybee Habits	Write about honeybees
Animal Instinct	Describe the instinctual behavior of sea turtles Describe how bats use sonar Define instinct
Man Protects Animals	Identify ways man protects animals
Project: Animal Scrapbook	Organize animal pictures by special characteristics

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Unit 3: MAN AND HIS ENVIRONMENT

Lesson Title	Objective
Ecology	Explain why ecology is called the 'web of life' Define ecology and environment
Project: Your Environment	Draw and describe your environment
Resources	Describe the importance of water, air, light, and soil List four important environmental resources
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: Populations	List the plant and animal populations in your environment
Balance of Nature	Understand that producers must be the largest population for an ecosystem to survive Explain the importance of balance in an ecosystem
Project: Make a Pyramid	Organize plants and animals in a population pyramid
Report: Rabbits in Australia	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: Still Water Life	Study plant and animal life in a still water community
Land Communities	Identify and describe organisms in a field, desert, and forest communities
Project: Human Communities	Write about the needs and structure of your community
Report: Read and Write	Write a story about the life of a bee
Project: Terrarium or Diorama	Create and observe a desert terrarium
Report: Forest Community	Write about plant and animal life in a forest community
Misuse of the Environment	Describe ways to conserve resources and protect the environment Describe different types of erosion and pollution Explain why many animals are endangered or extinct
Project: Ask an Expert	Write what you learned about soil Interview an agricultural agent
Report: Endangered Species	Write about an endangered animal
Resource Conservation	Describe ways to replace natural resources Explain how the sun can be used as a resource Describe ways to conserve existing resource
Report: How to Save Energy	List ways to save energy Write about renewable energy
Environmental Preservation	Describe how national parks preserve natural resources
Report: Special Treasures	Write about a national park

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Unit 4: MACHINES

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

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Unit 5: ELECTRICITY AND MAGNETISM

Lesson Title	Objective
Electricity	Identify the three particles in an atom Describe what happens when an atom loses or gains electrons Identify lightning as an electrical charge
Report: Thomas Edison	Write about Thomas Edison
Experiment: Static Electricity	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: Conductors	Classify items as conductors or nonconductors
Experiment: Wet Cell	Create a battery using wire and a lemon
Project: Electric Objects	List household items that use electricity
Electrical Use and Safety	List uses for electricity in everyday life Describe the safety benefits of fuses and circuit breakers Describe electrical safety precautions
Project: Fuses in Use	Study and write about car fuses
Magnetism	Explain how a generator makes electricity Describe the properties of a magnet Define and give examples of electromagnets
Experiment: Use a Magnet	Test the attraction between a magnet and various objects
Experiment: Make a Magnet	Make a magnet from a nail
Experiment: Magnet Poles	Identify the poles of a magnet
Experiment: Testing a Magnet	Test the north pole of a magnet
Experiment: Generate Electricity	Create an electrical current using a magnet
Experiment: Electromagnet	Create an electromagnet
Report: Explorers	Write about the explorers who discovered the North and South poles

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Unit 6: WATER AND MATTER

Lesson Title	Objective
Water	Identify the three states of water Describe what happens to water when it is heated and cooled Compare the Fahrenheit and Celsius temperature scales
Experiment: Ice	Examine the properties of ice
Experiment: Ice Volume	Compare the volume of ice and water
Water as a Liquid	Describe the importance of water in the body Identify sources of water in nature Describe the water cycle
Experiment: Potato	Determine the amount of water in a potato
Water as a Gas	Understand that when water condenses it changes from a gas to a liquid Describe the water cycle
Experiment: Forming Dew	Observe condensation
Water as a Solvent	Explain the difference between a solution and a suspension Compare soluble and insoluble substances
Experiment: Solubility	Compare the solubility of different materials
Matter	Describe the properties of common items Compare mass and weight of matter Describe the properties of solids, liquids, and gasses
Molecules and Atoms	Understand that molecules are made of atoms Understand that all matter is made of molecules
Experiment: Molecules	Compare the strength of smell of perfume and ammonia
Elements	Define element and give common examples Identify common elements by chemical sign

Unit 7: WEATHER

Lesson Title	Objective
The Atmosphere	Describe the characteristics of the troposphere and stratosphere. Identify the levels of the atmosphere. Understand that plants and animals need air to live.
Experiment: Air and Space	Determine if air has volume
Temperature	Describe how the sun heats the air Compare temperatures at high and low elevations
Experiment: Temperature	Compare the effect of heat on different materials
Air Pressure	Describe how wind is created by warm and cool air Compare air pressure at high and low elevations
Experiment: Pressure	Observe the effect of pressure
Forces of Weather	Describe storm safety precautions Describe the characteristics of different types of storms Explain how thunder and lightning can be used to tell the distance of a storm
Sand and Dust Storms	Describe the effects of sand and dust storms
Report: Hurricanes	Write about hurricanes
Prediction of Weather	Describe how different instruments are used to measure and predict weather
Project: Thermometers	Compare Fahrenheit and Celsius thermometers

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Unit 8: OUR SOLAR SYSTEM AND THE

Lesson Title	Objective
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: Astronomy Instruments	Write about one of the following: the telescope, spectroscope, or radio telescope
Essay: Astronomy	Write about the importance of the mind in astronomy
The Sun	Describe the importance of the sun
Essay: Ancient People	Explain the reason behind ancient beliefs about the sun
Movements	Describe how gravity affects the motion of the sun and planets Explain how Newton discovered gravity Describe the movement of the sun
Report: Isaac Newton	Write about Isaac Newton
Heavenly Bodies Around the Sun	Describe the characteristics of planets, meteors, comets, and asteroids Compare revolution and rotation
Our Moon	Explain the importance of the Apollo 11 mission Describe the characteristics of the moon and its orbit
Experiment: Moon Phases	Use a model to create phases of the moon
The Stars and Space	Describe how stars are used to tell seasons, time, and direction Compare astrology and astronomy
Essay: Astrology	Explain why astrology is a false science
The Milky Way and Other Galaxies	Understand that the universe is enormous and contains many other galaxies Identify our galaxy as the Milky Way

Unit 9: THE PLANET EARTH

Lesson Title	Objective
The Air (Atmosphere)	Identify and describe the layers of the atmosphere
Experiment: Condensation	Condense water on a glass
Gases in the Atmosphere	Understand that oxygen is necessary for life Identify the gases in the atmosphere
The Water (Hydrosphere)	Describe the water cycle Describe the distribution and sources of water on earth Explain the importance of water
Essay: Psalm 147	Interpret the meaning of Psalm 147
Salt Water	Describe the effects of ocean currents Describe the characteristics of oceans and seas
Experiment: Currents	Create a convection current in water
The Land (Lithosphere)	Identify the layers of the earth Describe the characteristics of each layer Describe how the spherical shape of the earth was discovered
Experiment: Shadows	Compare the shadows made by a disk and a sphere
Earth's Land Formations	Describe the effects of earth's gravity and magnetism Describe characteristics of mountains, plains, and volcanoes
Earth's Rotation and Revolution	Describe the rotation and revolution of the earth

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Unit 10: UNDERSTANDING GOD'S

Lesson Title	Objective
Review: The Solar System	Review the characteristics of the sun, moon, planets and stars Understand that God created the universe
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 the states of matter
Review: Water	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: Weather Scrapbook	Create a scrapbook on different types of weather
Review: Electricity and Magnetism	Review the parts of an atom Review the effects of gravity on the earth and in space Review electricity and electrical safety precautions Review magnetism and the use of electromagnets
Project: 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 flow of energy in a food chain/web Review the importance of balance in nature Review organisms in forest, desert, river, ocean, and field communities
Review: Conservation	Review causes of pollution and erosion Review ways to conserve energy and natural resources
Report: Passenger Pigeon	Write about passenger pigeons

Science 500

Unit 1: CELLS

Lesson Title

The Basic Unit of Living Things: A Cell	Give a basic definition of a cell and explain what a cell is. Identify different types of cells. Label the different basic parts of a cell.
Viewing Cells	Identify different types of cells.
Experiment: Skin Cells	Use a microscope to examine examples of different types of cells.
The Life and Activity of Cells	Explain in more detail the make-up of the cell membrane, cytoplasm, and nucleus. Identify different types of cells. Label the different basic parts of a cell.
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 functions of different types of animal tissue Describe the function of plant tissue
Cells: 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.
Reference	Examine some unique characteristics of plant and animal cells. Explain in more detail the make-up of the cell membrane, cytoplasm, and nucleus. Explain how cells reproduce and grow. Define what energy is and explain how plants and animals receive and produce energy. Use a microscope to examine examples of different types of cells. Give a basic definition of a cell and explain what a cell is. Label the different basic parts of a cell. Identify different types of cells. Examine types of plant and animal tissues.

Science 500

Unit 2: PLANTS: LIFE CYCLES

Lesson Title

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: 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: 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: Examining Cones	Identify the main reproductive parts of seed-bearing and spore-bearing organism.

Unit 3: ANIMALS: LIFE CYCLES

Lesson Title

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

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Unit 4: BALANCE IN NATURE

Lesson Title

Balance of Nature: Physical Environment	Understand that organisms depend on each other Explain the importance of carbon dioxide and oxygen for plants and animals Identify factors that are required for life Describe the carbon dioxide - oxygen cycle Describe the water cycle
Project: Cycles	Draw the water cycle, carbon cycle, and chemical cycle
Ecosystems	Define and identify producers, consumers, and decomposers Explain why nature needs population differences between producers, consumers, and decomposers Identify and describe food chains in nature
Project: Terrarium Project	Build the terrarium.
The Prairie: Web of Life	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: Prairie Land	List prairie lands in North America
The Prairie: Web of Life (Part 2)	Define and identify producers, consumers, and decomposers Explain why nature needs population differences between producers, consumers, and decomposers Identify and describe food chains in nature
Report: Prairie Birds	Write about a prairie bird
The Prairie: Food Chains	Explain food chains
Project: Prairie Food Chain	List food chains found in the prairie
Project: Special Environments	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 5: TRANSFORMATION OF ENERGY

Lesson Title

Energy	Identify forms of energy Describe energy Describe work
Work	Understand work
Work From Energy	Understand how to measure work Define work
Experiment: Heat From the Sun	Investigate how light energy and temperature are related
Forms of Energy	Define friction Describe forms of energy
Experiment: Heat from Bending	Investigate how movement and heat are related
Experiment: Heat Energy from a Chemical Reaction	Investigate the transformation of chemical energy to heat energy through observation of the change in temperature.
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: Solar Energy for Heat	Investigate how light energy and water temperature are related

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Unit 6: RECORDS IN THE ROCK: THE FLOOD

Lesson Title

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: Ancient Flood Stories	Research and answer questions about flood stories from other cultures
After the Flood: The Bible Record	Explain the relationship between Bible records of the Flood and physical records. Identify changes in the earth after the Flood. Describe Bible records of the earth before, during, and after the Flood.
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 7: RECORDS IN THE ROCK: FOSSILS

Lesson Title

Fossil Formation	Describe characteristics of different fossil types Explain where fossils may be found
Project: Mold Fossil Copy	Create a copy of a fossil mold Create a copy of a fossil mold
Fossil Formation Part 2	Understand that fossils are the result of rapid burial Describe how petrified and carbonized fossils are formed
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: Plant and Animal Fossils	Draw a picture and write an article about a plant or animal group
Reading Fossils: Difficulties	Identify clues that can help identify fossils Describe how scientists use clues to make conclusions about fossils Identify difficulties in fossil identification
Project: Fossil Clues	Identify clues for fossil identification
Reading Fossils: Reconstruction	Describe how scientists reconstruct fossils
Project: Label the Skeleton	Use a skeleton to infer what an animal might have looked like
Project: Be Creative	'Reconstruct' a skeleton using bones of different animals

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Unit 8: RECORDS IN ROCK: GEOLOGY

Lesson Title

Features of the Earth	Describe the size and shape of the earth
Project: Compare an Orange and the Earth	Compare your observations to the appearance of the earth's surface Examine the skin of an orange at two different distances
Layers of the Earth	Describe the earth's layers
Rocks on the Earth's Surface	Describe the rocks on the earth's surface
Project: Examine a Mineral	Examine the structure of salt using a magnifying glass
Kinds of Rocks	Describe the different kinds of rocks
Report: Rocks	Research and write about a type of rock
Project: Rock Hunt	Complete an activity about rocks
Changes in the Earth: Surface Change	Tell how the surface of the earth is changing Describe the forces that change the earth's surface Compare the structure of minerals in rocks and in their natural state
Experiment: Erosion	Investigate the effect of running water on soil erosion
Causes of Surface Change	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: Volcano Summary	Research and write a summary on a famous volcano
Results of Forces	Understand that the earth is always changing

Unit 9: CYCLES IN NATURE

Lesson Title

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

Science 500

Unit 10: LOOK AHEAD

Lesson Title

Living Things: Plants, Fungi, Protists, and Monerans	Review the heirarchy 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 characteristics, life cycles, and reproduction of vertebrates
	Review common protozoa and invertebrates
Living Things: Balance of Nature	Review how all living things depend upon one another
The Earth: Records of Life	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	Describe the balance of nature.
Energy and Work	Identify types of energy and work
Matter	Review cycles in nature
	Review the structure and properties of matter
	Review physical change and chemical change

Science 600

Unit 1: PLANT SYSTEMS

Lesson Title

Photosynthesis: Location	Identify the location of photosynthesis Identify parts of a leaf
Experiment: Anacharis Photosynthesis	Investigate the effect of light on photosynthesis
Photosynthesis: The Leaf Factory	Understand that only green plants can make food using photosynthesis Describe how the carbon cycle affects photosynthesis Identify the components and products of photosynthesis
Experiment: Seeds	Investigate the effect of light on growth of a seed Investigate the effect of water on growth of a seed
Photosynthesis: Products	Describe how glucose is used to make starch, fats, and proteins Use an equation to represent photosynthesis
Experiment: 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	Describe how roots transport and store water and food Identify and describe parts of a root
Experiment: Root Observation	Examine root hairs on a sprouting seed
Transport System: Stems and Leaves	Identify and describe parts of a leaf Identify parts of a stem
Experiment: Celery	Observe the transport of water in a celery stalk
Regulatory System	Describe how natural plant chemicals help plants grow Describe how artificial chemicals affects plants
Experiment: Growing Roots	Observe the growth of a plant from a cutting

Science 600

Unit 2: BODY SYSTEMS

Lesson Title

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

Science 600

Unit 3: PLANTS AND ANIMAL BEHAVIOR

Lesson Title

The Nervous System	Identify and describe the functions of the cerebrum, cerebellum, and medulla Describe the structure and function of the nervous system
Report: The Eye	Write about the structure and function of the eye Write about the structure and function of the ear
Nerves and Spinal Column	Identify and describe the structure of a neuron Describe the function of the spinal cord and nerves Identify the functions controlled by the ganglia and plexus
Response and Intelligence	Recognize man's superior intelligence over animals Compare and give examples of instinct, reflex, and learned response Describe three types of learned response
Report: Instincts	Write about animal instincts
Experiment: Response	Teach a response to a goldfish
Experiment: Trial and Error	Investigate the effect of practice on performance
Plant Behavior	Describe the behavior of touch-sensitive plants Describe the role of auxin in phototropism Define and describe the different types of tropisms
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: Man's Influence	Write about an extinct or endangered animal

Science 600

Unit 4: MOLECULAR GENETICS

Lesson Title

Reproduction	Describe the reproductive structures of flowers in relation to inheritance in plants.
Project: Flower Structure	Dissect and examine the structure of a flower
Male-Female Reproduction	Compare mitosis and meiosis Understand that the number of chromosomes is halved during meiosis
Project: Lima Bean Embryo	Dissect and examine the structure of a bean embryo
Inheritance	Distinguish between dominance and recessiveness. Solve a Punnett Square and analyze the data. Explain how many traits depend on multiple genes. Introduce the work of Gregor Mendel on genetic traits.
Project: Mendel's Discovery	Use a Punnett Square to predict offspring of pea plants Examine the genetic characteristics of pea seeds
Taste, Dominance, and Multiple Genes	Explain incomplete dominance Describe the function of taste buds Understand that many traits are controlled by more than one gene
Experiment: Taste Gene Lab	Investigate your genetic make-up for PTC taste
Project: 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: Albinos	Investigate the frequency of albinism in seedlings
Report: Genetics	Explain how genetics have improved plants or animals
Mutation	Understand that mutations do not add new genes Explain why mutations do not support evolutionary theory Describe albinism
The Use of Mutations	Describe how mutations are used to grow fruit
Project: Pea Pod	Observe the size of peas in a pod
Temperature Influence on Coloration	Give examples of the interaction between genes and the environment.

Science 600

Unit 5: CHEMICAL STRUCTURE AND CHANGE

Lesson Title

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

Science 600

Unit 6: LIGHT AND SOUND

Lesson Title

Waves: Sound	Name the source of all sound and tell how sound waves travel. Name the speeds of light and sound. Describe the parts of a sound wave and a light wave. Explain the difference between amplitude and pitch. Describe the electromagnetic spectrum. Describe how sound waves are received by the ear. List some substances through which sound can travel and through which light can travel.
Experiment: Test Tube Tunes	Investigate how the amount of water in a test tube and pitch are related
Project: Sound Vibrations	Use a tuning fork to observe sound vibrations
Light Waves	Describe how refraction and reflection affect light waves Compare the speeds of sound and light Compare how transparent, translucent, and opaque materials affect light waves
Project: Light Waves	Demonstrate refraction of light using simple materials.
Project: Refracted Light	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: Color Spectrum	Create the visible spectrum
Project: Create a Rainbow	Create a rainbow using water
Colors	Explain what makes things around us different colors.
Project: Color Wheel	Make a color wheel Understand that white light contains all the colors in the spectrum
Experiment: Subtractive Colors	Create different colors using paper and cellophane Understand that objects absorb all colors except the color you see
Experiment: Mixing Colored Lights	Create different colors using cellophane
Mixing Colors	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: Mixing Colorants	Create different colors using food coloring

Science 600

Unit 7: MOTION AND ITS MEASUREMENT

Lesson Title

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

Unit 8: SPACESHIP EARTH

Lesson Title

Earth's Motion	Describe earth's size and shape and its motion through space.
Experiment: Balloon Globe	Explain the seasons of the year and how they occur.
Earth's Rotation	Describe Earth's rotation. Identify the cause of seasons and daylight hours. Compare daylight hours from different locations at different times during the year.
Time	Define the time zones on earth and be able to locate the prime meridian and the International Dateline.
Experiment: 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: Fact or Opinion	Identify statements as fact or opinion.
Experiment: Eclipses	Describe what happens during a solar eclipse and a lunar eclipse.
The 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.
The Solar System	Name and describe the main parts of our solar system.
Report: 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.

Science 600

Unit 9: ASTRONOMY AND THE STARS

Lesson Title

Astronomy	Correctly interpret findings of astronomy in light of faith in God and His creation of the universe. Define and describe the science of astronomy. Know some of the important people and events in the history of astronomy.
Report: 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: The Spectroscope	Make a spectroscope Compare the spectra of different light sources
Experiment: Spectrography	Compare the spectra of different light sources
Experiment: 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	Understand how the stars are used to determine location. Know and identify some major constellations and stars.
Project: Betelgeuse and Aldebaran	Rearrange the letters in Betelgeuse and Aldebaran to make new words
Project: Constellations	Draw the arrangement of stars in common constellations

Science 600

Unit 10: THE EARTH AND THE UNIVERSE

Lesson Title

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 different types of muscle Review the structure and function of the skeletal system
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: 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. Name and describe the various parts of our Solar System.
Our Solar System	Describe how stars differ and identify some of their main characteristics. Identify important people, events, and observing equipment in the history of astronomy. Name and describe the various parts of our Solar System.

General Science I

Unit 1: WHAT IS SCIENCE?

Lesson Title

Tools of a Scientist 1	Identify three processes of scientific investigation List the five senses Identify the basic metric units for measurement. Understand the purpose of science
Tools of a Scientist 2	Distinguish between inductive and deductive reasoning Identify the purpose and major categories of the classification systems
Methods of a Scientist 1	Are the concentric rings related to the age of the tree? What caused the rings to grow unevenly? What causes the rings to vary in width?
Methods of a Scientist 2	Describe and apply the final steps of the scientific method
The Scientist	List achievements of George Washington Carver Describe characteristics of a scientist
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.

Unit 2: PERCEIVING THINGS

Lesson Title

Measurement: The Metric System	List standard units and order metric system prefixes Identify how standard units are used for measurement in science Explain the advantages of the metric system
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 Convert liters to milliliters and milliliters to cubic centimeters Calculate volume using the formula: volume = l x w x h
Measurement: Mass	Convert kilograms to grams, milliliters, and cubic centimeters Distinguish between mass and weight Identify the standard unit for mass
Graphs: Uses, Bar, and Line	Distinguish between independent and dependent variables Understand and list the uses of graphs Interpret the information given by a bar or line graph Identify the components of line and bar graphs
Graphs: Pictographs and Pie Charts	Understand the uses of pictorials and pie charts Interpret information given in a pictorial or pie graph
Experiment: Making Graphs	Design three different graphs using the Excel application Design and draw three different graphs based on information given in tables

General Science I

Unit 3: EARTH IN SPACE (PART 1)

Lesson Title

Stargazing	Identify and apply the astronomers' unit of measure for calculating distances in the universe Distinguish between astrology and astronomy Discuss what Scripture tells us about the sun, moon, and stars Describe the environs of our solar system
Star Charts	Identify characteristics of meteors and meteor showers Describe Aristotle's Geocentric theory and Ptolemy's modification Utilize star charts to locate constellations Identify the principal constellations of each season
Experiment: Constellations	Draw and construct a Zodiac Constellation Finder Chart the different constellations as they appear after sunset
Astronomy	Identify basic features of the 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 Define and apply working definitions of altitude and azimuth
Experiment: Astrolabe	Write a report of findings Test the astrolabe by locating and recording positions of heavenly bodies Build an astrolabe
Astronomers	Identify parts of the telescope and distinguish between refracting and reflecting telescopes Compare the positions of Copernicus and Ptolemy List the early astronomers and their contributions to Heliocentric theory List important tools of the astronomer
Essay: Galileo	Write a two-page report using references correctly

Unit 4: EARTH IN SPACE (PART 2)

Lesson Title

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 Define retrograde motion and provide an example
Outer Planets	Distinguish between perihelion and aphelion Identify planet characteristics that do not support evolutionary theories of the origin of the solar system Identify the Jovian planets and some of their defining characteristics
Asteroids and Comets	Provide evidence about comets that supports a young solar system Identify defining characteristics of asteroids and comets Calculate weight on another planet's surface
The Moon	Identify characteristics of the orbit, phases and rotation of the moon Explain how the moon effects the tides
Eclipses	Distinguish between a solar and lunar eclipse Identify characteristics of total and partial eclipses

General Science I

Unit 5: THE ATMOSPHERE

Lesson Title

Structure of the Atmosphere	Identify the primary gases found in the atmosphere Identify the five layers of the atmosphere Describe the function of the ozone layer
Solar Effects	Describe the role of the atmosphere in respiration and photosynthesis Describe the greenhouse effect List ways in which the atmosphere protects mankind
Experiment: The Greenhouse	Construct a simple greenhouse Measure and record temperatures Summarize data
Natural Cycles	Understand that all natural cycles are dependent on one another 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
Pollution	Describe the effects of pollutants on humans, animals, and plants Recognize the responsibility of a Christian to help minimize pollution Name the different types of pollutants found in the atmosphere

Unit 6: WEATHER

Lesson Title

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

General Science I

Unit 7: CLIMATE

Lesson Title

Climate: General	Understand how the four factors contribute to the long-term climate of a region Review the four factors that affect weather and climate Compare and contrast weather and climate
Climate: Worldwide	List methods used to classify an area's climate Identify how altitude and bodies of water affect climate List and describe the five basic climate areas. Distinguish between latitude and longitude
Climate: Regional	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 8: THE HUMAN ANATOMY (PART 1)

Lesson Title

Human Building Blocks	Identify the structure of the typical cell Describe the basic functions of the cell
Experiment: Cheek Cell	Collect, observe, and describe cheek cells, guided by the video model Use science equipment and supplies according to instructions Summarize findings based on observations
Human Framework	List the muscle types together with their functions Explain the functions of the skeletal system Identify some of the major bones of the skeletal system.
Skin	Identify reasons why people from around the world have different skin colors. Explain the functions of the skin Identify the three layers of the skin
Human Nervous System	Identify the 3 main parts of a neuron Describe how nerve impulses travel from one neuron to the next List vital functions of the spinal cord and the brain
Project: Human Brain	Plan and write a five-hundred word report Conduct research of an interesting aspect of the brain using reliable sources 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.

General Science I

Unit 9: THE HUMAN ANATOMY (PART 2)

Lesson Title

The Respiratory System	Explain the functions of the organs involved in the respiratory system Name the organs involved in the respiratory system
The Circulatory System	List functions of the different blood vessels Describe the structure and function of the heart Identify the organs that make up the circulatory system
Experiment: Heart Rate	Compare a resting heart rate to a rate following brief exercise Calculate heart rate using both abbreviated and standard methods Record data and summarize findings
The Digestive System--Part 1	Identify the parts of a tooth Identify the parts of the digestive system and describe their functions List the three functions of the digestive system
The Digestive System--Part 2	Trace the path a piece of food travels through the digestive system Describe the structure and the functions of the small and large intestine Discover how the liver, pancreas, and the gall bladder assist in digestion
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

General Science I

Unit 10: WORKING IN SCIENCE

Lesson Title

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

General Science II

Unit 1: SCIENCE AND SOCIETY

Lesson Title

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

General Science II

Unit 2: STRUCTURE OF MATTER (PART 1)

Lesson Title

Properties of Matter (1)	State Archimedes Principle Explain how to use mass and volume to find the density of an object Describe the ways matter can be classified Define and describe the two fundamental properties of all matter Distinguish between boiling point and freezing point
Experiment: Determining Volume	Utilize the method of displacement to determine volume Measure a common geometric shape in centimeters and record answers Answer questions and summarize results Calculate volume for the geometric shape
Experiment: Metric Measurements	Calculate density from data on mass and volume Read a Celsius thermometer Calculate volume from measurements Utilize a balance to find mass
Properties of Matter (2)	Distinguish between crystalline and amorphous solids Identify the three states of matter Explain what a chemical property is
Atoms and Molecules	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 Define atomic mass (weight)
Molecules	Define molecules Describe how bonds are formed in molecules Explain the molecular model of matter
Elements	Calculate the number of electrons, protons, and neutrons in a given atom Examine how the periodic table is organized Define element
Compounds	Explain what a compound is and how it forms Analyze the use of chemical formulas to name a compound Interpret a chemical formula
Mixtures	Define mixtures Provide an example of a mixture
Experiment: Mixtures	Utilize a filter to separate a mixture of sand and water Summarize your findings

General Science II

Unit 3: STRUCTURE OF MATTER (PART 2)

Lesson Title

Matter and Change	Describe and give an example of a physical change Differentiate between a physical and chemical change Explain the effects of heat on matter Describe the processes of evaporation and condensation Distinguish between the heat of fusion and the heat of vaporization Calculate heat energy changes in phase changes of different substances
Experiment: Phase Changes	Record the data Summarize your findings
Solutions	Recognize the difference between homogeneous and heterogenous mixtures Differentiate between solutions and mixtures Distinguish between colloids and suspensions
Chemical Changes	Define and provide an example of oxidation List some indicators of a chemical change Explain the Law of Conservation of Mass Interpret a chemical equation Distinguish between a physical and chemical change and provide an example of each
Experiment: Forms of Change	Determine the change as physical or chemical 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 Define indicator and give an example
Bases	Describe properties common to all bases Provide an example of an indicator for a base List some common bases
Experiment: 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

Unit 4: HEALTH AND NUTRITION

Lesson Title

Foods and Digestion	Trace the path food takes through the digestive system List the six types of nutrients and provide examples of each Examine the purpose of each nutrient
Diet	Provide examples from each section of My Plate Examine the basis of My Plate and its design
Experiment: Food Record	Write a description of the foods eaten in each category Record your diet for a week utilizing the chart
Nutritional Diseases	Discuss the use of chemicals in food production and their effects Describe symptoms of various vitamin deficiencies Evaluate the relationship between allergic reactions and addiction reactions Examine the importance of healthy foods to a diet
Essay: Nutrition	Write an essay about nutrition
Hygiene	Recognize the contributions of Louis Pasteur Demonstrate knowledge of proper health maintenance Identify the primary way to control contagious diseases

General Science II

Demonstrate knowledge of good hygiene

General Science II

Unit 5: ENERGY (PART 1)

Lesson Title

Mechanical Energy	Distinguish between kinetic and potential energy Define energy Compare force and work
Potential Energy	Provide examples of objects possessing potential energy Define potential energy
Other Forms of Energy	Distinguish between heat and temperature Explain how heat is produced by friction when work is done 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	Describe the structure of the atom and its subatomic particles State the Law of Conservation of Matter and Energy Distinguish between fission and fusion Recognize that mass is converted to energy in a nuclear reaction
Energy Conversion and Entropy	Explain how generators convert mechanical energy to electricity State the Second Law of Thermodynamics Discuss some common energy conversions Define entropy Understand that in order to do work, energy must be converted from one form to another
Essay: Entropy	Write a report on the implications of entropy to a Christian

Unit 6: ENERGY (PART 2)

Lesson Title

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

General Science II

Unit 7: MACHINES (PART 1)

Lesson Title

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

Unit 8: MACHINES (PART 2)

Lesson Title

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

General Science II

Unit 9: BALANCE IN NATURE

Lesson Title

Photosynthesis and Food	<ul style="list-style-type: none">Describe a basic leaf structureExplain the two phases of photosynthesisExplain how chlorophyll acts as a catalyst in plant cellsDescribe the function of the stomata
Food	<ul style="list-style-type: none">Recognize the accomplishments of Gregor Mendel and Luther Burbank to the field of geneticsDiscuss the history of food production and the importance of the Industrial Revolution to it
Natural Cycles	<ul style="list-style-type: none">Understand the importance of bacteria and fungi to decayUnderstand the relationship between legumes and bacteriaList some strategies for preventing decayExplain the process of nitrification by bacteria
The Water Cycle	<ul style="list-style-type: none">Differentiate between evaporation, precipitation, and transpirationExplain how photosynthesis and respiration are the basis of the carbon-oxygen cycleExplain the water cycle on earth
Balance and Disruption	<ul style="list-style-type: none">Discuss the causes of ecological disruptions and provide examplesUnderstand how natural controls work in a communityRecognize the difference between habitat and communityDefine EcologyExplain what a food chain is
Resources	<ul style="list-style-type: none">Understand the importance of recyclingRecognize the causes of water and air pollution and strategies to correct themExplain why proper agricultural and forestry practices are essential to the future of soil and forestsEvaluate the use of alternative energy sources to conserve fossil fuelsDiscuss some negative impacts to wildlife and the wilderness caused humans

General Science II

Unit 10: SCIENCE AND TECHNOLOGY

Lesson Title

Basic Science	<ul style="list-style-type: none">Review the steps of the scientific methodRecognize science and technology as a career choiceUnderstand the use and importance of the metric system to science
Characteristics of Matter	<ul style="list-style-type: none">Review the ways to classify matter by propertiesProvide an example of a mixture and recognize that mixtures can be separated by physical meansReview the four facts that describe matterDiscuss the discovery of the atom and elementsUnderstand the use of chemical symbols and formulas to denote elements and compounds
Matter in Change	<ul style="list-style-type: none">Review physical changes and provide examplesDistinguish an acid from a baseReview chemical changes and provide examples
Chemical and Atomic Energy	<ul style="list-style-type: none">Review the use of the atom for energy purposes and for destructionReview entropyDiscuss the pros and cons of using atomic (nuclear) energyReview the interpretation of a chemical equationReview the First and Second Law of Thermodynamics
Magnetism and Electricity	<ul style="list-style-type: none">Understand what current electricity is and its sourcesUnderstand how magnets and electromagnets are usedCompare magnetism and electricityReview magnetic theoryExplain lightning as an example of static electricity
Machines at Work	<ul style="list-style-type: none">Describe the six types of simple machines and evaluate the mechanical advantage of eachProvide examples of when friction is helpful and when it is harmfulReview how machines help us do work
Life Science	<ul style="list-style-type: none">Review the natural cycles common to the earthReview photosynthesisReview My Plate as an important guideline for a proper dietUnderstand that a nutritious diet and proper hygiene are preventative measures for disease and other illnessesReview the six essential nutrients and provide examples of each
Vocations in Science and Technology	<ul style="list-style-type: none">Review desirable job application skillsReview and assess skills and areas of interest that they haveExplore and evaluate science and technology as possible avenues for a career

Integrated Physics and Chemistry

Unit 1: EXPLORATIONS IN PHYSICAL SCIENCE

Lesson Title

What is Science?	Describe the difference between a scientific analysis and an opinion. Give examples of the types of things chemists and physicists do. Identify the major branches of science.
The Scientific Method	Note the two general types of research. Recognize a testable and falsifiable hypothesis. State the steps in the scientific method.
Experiment: Making Observations	Make valid observations. Write a scientific report. Draw conclusions concerning what constitutes 'good observations.' Recognize a valid hypothesis.
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	Read data from a graduated cylinder. Understand the concept of volume. Measure volume using two different methods. Recognize the metric units of volume.
Experiment: Determining 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. Use geometric formulas to determine metric volume.
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. Present your findings in a scientific report. Design and carry out a scientific investigation.
Experiment: Density Column	Recognize the characteristics of density. Design and carry out a scientific investigation. Present your findings in a scientific report.
Review	Practice problem solving techniques demonstrated in this unit. Review topics discussed in this unit.

Integrated Physics and Chemistry

Unit 2: THE STRUCTURE OF MATTER

Lesson Title

The History of Atomic Theory	Understand that models of the atom are based on empirical evidence and are revised as new information becomes available. Understand how technology can contribute to the understanding of scientific principles. Become familiar with some of the early concepts of the atom.
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. Describe the properties of the subatomic particles. Identify and define the subatomic particles.
Elements and Their Properties	List some physical and chemical properties of metals. Describe and give an example of a metalloid. List some physical and chemical properties of nonmetals.
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	List some of the elements in each section of the periodic table. Identify the major sections 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. Compare your conclusions to those of others and to your initial hypotheses. Discuss any flaws in the procedure that may have affected the results. Use data to determine the identity of a sample. Follow procedures for determining density of a sample.
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. Differentiate between elements and compounds. State the law of definite proportions. Identify the number and types of atoms in a compound. Name a binary compound.
Mixtures	Identify examples of homogeneous and heterogeneous mixtures. Recognize the various types of heterogeneous mixtures. Distinguish between pure substances and mixtures. Distinguish between homogeneous and heterogeneous mixtures. Recognize the properties of homogeneous 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	Practice problem solving techniques demonstrated in this unit. Review topics discussed in this unit in preparation for the unit test.

Integrated Physics and Chemistry

Unit 3: MATTER AND CHANGE

Lesson Title

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	Determine how many calories of heat energy are needed to change the temperature, or state, of a sample. Describe the effect of energy levels within a substance upon the molecules of that substance. Identify the relationship between the energy level within a substance and changes in temperature or state of matter.
Experiment: Graphing Changes of State	Observe and collect accurate data as the water changes state. Use your knowledge of changes of state to hypothesize how you will determine when the water sample is boiling. 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	Describe the steps involved in the dissolving process. Explain the chemical relationship between solutes and solvents that determines whether or not a solution will form. List some factors that increase the rate of solution.
Acids and Bases	Understand the use of indicators to analyze pH. Describe the chemical make-up of an acid and of a base. List some properties of acids and bases. Understand and use the pH scale.
Experiment: The Cabbage Indicator	Describe how indicators can be used to determine if a solution is acid or base.
Chemical Bonding	Describe the three major types of chemical bonding. Understand that bonding creates new substances with different physical and chemical properties. Explain how atoms enter into bonding situations.
Atomic Structure and Bonding	Understand the concepts of exothermic and endothermic processes. 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. 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	Identify a balanced equation. State the law of conservation of mass. Understand the purpose of a chemical equation. Perform an atomic inventory.
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 fission. Describe the process of nuclear fusion. List positive and negative factors associated with nuclear reactions. Identify some applications for nuclear reactions.
Review	Practice problem solving techniques demonstrated in this unit. Review topics discussed in this unit.

Integrated Physics and Chemistry

Unit 4: STATES OF MATTER

Lesson Title

Properties of Solids	List some of the properties used to classify solids. Describe how bonding patterns determine some of the properties of solids. Describe some of the differences between crystalline and amorphous 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	List some uses for conductors, superconductors, semiconductors, and insulators. Describe materials as conductors, superconductors, semiconductors, or insulators. Describe the basic bonding structure of conductors and insulators.
Characteristics of Liquids	State and describe some of the common characteristics of liquids. Define a liquid.
Experiment: Viscosity	Compare and describe the viscosity of several liquids.
Pressure in Liquids	Give examples of phenomena that arise due to differences in pressure. Define pressure. Explain the difference between mass and weight.
Archimedes' Principle and Flotation	Explain how differences in pressure relate to buoyant force. List some applications of Archimedes' principle. State Archimedes' principle.
Liquids and Capillary Action	Explain why evaporation is necessary to move water up a tree. Explain how surface tension and adhesive and cohesive forces contribute to capillary action.
General Characteristics of Gases	Describe some of the factors that determine the rate of diffusion in a gas. Calculate the molecular weight of a substance. Become familiar with the statements of the kinetic molecular theory. Describe the motion of the particles in gases.
Pressure and Volume in Gases	Use Boyle's law to solve pressure/volume problems for gases. State the relationship between pressure and volume in a gas. 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	Describe the concept of an ideal gas and explain why it is useful. Convert temperatures from Celsius to Kelvin. Use Charles's law to solve temperature-volume problems for gases. State the relationship between temperature and volume in a gas. Understand the concept of absolute zero.
Review	Practice problem solving techniques demonstrated in this unit. Review topics discussed in this unit.

Integrated Physics and Chemistry

Unit 5: MOTION AND FORCES

Lesson Title

Distance and Displacement	Understand and apply the concepts of distance and displacement. Work problems involving multiple displacements. Review the metric system.
Speed and Velocity	Work problems using the velocity formula. Explain the difference between speed and velocity. Understand that separate velocities can be combined.
Acceleration	Apply formulas for acceleration. Understand that a force must be applied to an object to cause acceleration. Describe acceleration and give examples from everyday life.
Motion Graphs	Determine the slope of a motion graph. Become familiar with and analyze various motion graphs. Interpret the meaning of the slope of various motion graphs. Review graphing techniques.
Experiment: Motion Graphs	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. Design an experiment to determine the velocity of a battery-powered toy car.
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	Use Newton's second law in calculations. State each of Newton's three laws. Recognize and give examples of each of Newton's laws.
Experiment: Propulsion	Describe the action and reaction forces in propulsion devices.
Centripetal Force	List various sources of centripetal force. Describe why an object is able to move in a circular path. Do calculations using equations for centripetal force.
Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Integrated Physics and Chemistry

Unit 7: WORK AND ENERGY

Lesson Title

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	Use the law of conservation of mechanical energy in calculations. State the law of conservation of mechanical energy. State the law of conservation of energy. Discuss how non-conservative energy transfers result in the reduction of useable energy.
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 amount of work done on an object relates to how far it moves. Describe how the kinetic energy of an object relates to the amount of mechanical energy it can transfer to another object.
Power	Explain the relationship between work and power. Use the formula for power in calculations. State the metric unit for power.
Simple Machines; Levers	Use torque calculations to determine if a lever is balanced. List the three ways that simple machines can make work easier. Describe and give examples of the three classes of levers. Name the six simple machines.
Mechanical Advantage and Efficiency	Describe factors that affect the efficiency of any machine. Use formulas to calculate IMA and efficiency. Understand the concept of efficiency and how it applies to simple machines. Distinguish between the ideal and actual mechanical advantages for a simple machine.
Pulleys; Wheels and Axles	Describe and give examples of wheel and axle systems. Calculate the IMA and efficiency of a pulley and a wheel and axle. Describe and give examples of pulley systems.
Inclined Planes, Wedges, and Screws	Calculate the IMA and efficiency for an inclined plane. Describe and give examples of an inclined plane, a wedge, and a screw.
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.

Integrated Physics and Chemistry

Unit 8: HEAT FLOW

Lesson Title

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	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. Identify the relationship between heat flow and temperature differences.
Heat Flow	Describe methods to increase the insulation value of a material. Distinguish between and give examples of heat flow due to conduction, convection, and radiation. Understand why some materials are better insulators than others.
Experiment: Insulators	Build and use a calorimeter to measure rate of heat loss. Analyze data using comparative graphs.
Heating Systems	Understand how local conditions affect the choice of heating systems. Distinguish between convection and radiation heating systems. Describe various home heating mechanisms.
Experiment: Heat and Expansion	Relate observations about thermal expansion to real world situations. Observe the volume effect of heat loss as water changes from the liquid to solid state. Observe the volume effects of heat absorption on liquid water.
Cooling and Refrigeration	Understand the usefulness of refrigeration. Understand the principles of the refrigeration cycle.
Heat Engines	Distinguish between and provide examples of internal and external combustion engines. List and describe each step in the four-stroke engine cycle. Understand the basic principles of thermodynamics that control the conversion of heat to mechanical energy.
Review	Review topics discussed in this unit. Practice problem solving techniques demonstrated in this unit.

Integrated Physics and Chemistry

Unit 9: ELECTRICITY AND MAGNETISM

Lesson Title

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

Integrated Physics and Chemistry

Unit 10: WAVES

Lesson Title

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	Discuss the propagation of different wave forms through various types of media. Identify the three basic wave forms and describe their motion. Give examples of the three basic wave forms in nature.
Properties of Waves	Calculate the speed of a wave. List the physical properties that affect the speed of a wave in a given medium. 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.
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 density of the medium and speed of a wave.
The Behavior of Waves	Distinguish between reflection and refraction. Predict how two waves will interfere based on the principle of superposition. Provide examples of reflection, refraction, and diffraction. Describe the behavior of a wave at the boundary between two media.
Sound Vibrations	Describe the relationship between the speed of sound and the temperature of a gas, such as air. Understand that sound waves transmit energy. Explain sound waves in terms of pressure. Describe how sound is created. Calculate the speed of sound in various media.
Detecting Sound	Explain the relationship between the frequency of a wave and pitch. Describe how the ear processes a sound wave. 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. Describe how pitch can be changed in instruments that are tapped (percussion) or blown into (woodwinds and brasses). Confirm that a vibrating object can create the sensation of sound.
Doppler Effect	Explain the change in pitch observed when a sound passes by. List some practical applications of the Doppler effect. Describe the relationship between the speed of sound and the creation of a sonic boom.
Beats, Resonance, and Harmonics	List some factors that determine the resonance frequency of an object. Give some examples of resonance. Describe the relationship between wave interference and the creation of beats. Explain the relationship between resonance frequencies and harmonics.
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.
Properties of 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. Distinguish between luminous and illuminated objects. Give examples of materials that are transparent, opaque, and translucent to visible light.

Integrated Physics and Chemistry

Unit 10: WAVES, CONTINUED

Lesson Title

Reflection and Mirrors	Distinguish between plane, concave, and convex mirrors and provide examples of uses for each. Describe the relationship between absorption, reflection, or transmission of light and color. Understand and interpret ray diagrams for mirrors. Understand the differences between the absorption, reflection, or transmission of light.
Experiment: Law of Reflection	Make observations and measurements to test the law of reflection. Analyze your results to determine accuracy.
Lenses	Provide examples of uses for convex and concave lenses. Understand and interpret ray diagrams for convex and concave lenses. Describe images formed by convex and concave lenses.
Review	Practice problem-solving techniques demonstrated in this unit. Review topics discussed in this unit.

Unit 11: CHEMISTRY AND PHYSICS IN OUR WORLD

Lesson Title

Carbon Dioxide and Global Warming	Explain the relationship between greenhouse gases and global warming. List some of the exchanges in the carbon cycle. Identify which solar energies are transmitted, absorbed, or reflected by Earth's atmosphere. Discuss methods to reduce your carbon footprint. Describe the process that traps thermal energy in the atmosphere.
Experiment: Carbon Dioxide and Water Acidity	Relate levels of dissolved carbon dioxide to pH.
Fossil Fuels' Effect on the Environment	Explain why increased amounts of atmospheric carbon dioxide lead to ocean acidification. Describe how smog is created and list some of the effects of smog. List some of the outcomes of ocean acidification. Identify the contaminants that cause acid rain. List some of the outcomes of acid rain.
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. List Kepler's three laws. Give examples of how the study of astronomy is useful in the present day. Distinguish between geocentric and heliocentric theories.
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 1: KEY TO ORGANIZATION

Lesson Title

The History of Taxonomy	Define species Define taxonomy Discuss the history of taxonomy Explain why Carolus Linnaeus is referred to as the 'Father of Taxonomy'
Binomial Nomenclature	Identify the two parts that make up the binomial name List the seven levels of classification Understand the purpose of using Latin for binomial nomenclature
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: Fruit	Create and utilize a dichotomous key to classify a variety of fruits
Activity: Keying Plants	Select ten flowers to make a dichotomous key
Activity: Keying Animals	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: Research	Write a report on the origin of life
Project: Origins	Choose one of the following projects on origins
Molecular Basis of Life	Define atomic number and atomic mass

Biology

Unit 2: CHEMISTRY OF LIFE

Lesson Title

Molecular Basis of Life	Describe the structure of the atom Distinguish between molecules, diatomic molecules, compounds, and mixtures Identify the essential elements in living organisms
Properties of Compounds	Describe an ionic bond and provide an example Differentiate between cations and anions Understand why elements combine
Experiment: Static Electricity	Perform an experiment of ionic bonding
Covalent Bonding	Describe what a hydrogen bond is Differentiate between intramolecular bonds and intermolecular bonds (forces) Explain covalent bonding and provide an example
Experiment: Temperature Control	Investigate water as a temperature control
Importance of Inorganic Compounds	Describe the actions of acids, bases, and salts when dissolved in water Discuss why water is the medium in which living processes occur Distinguish between acids and bases
Experiment: Water Properties	What possible advantages does hydroponic gardening (growing plants in water) have over growing plants in soil? Explain the results. Give the results
Experiment: Indicators	Determine acidity and basicity of common household products utilizing indicators
Chemical Reactions	Define activation energy Distinguish between the four types of chemical reactions Explain the Law of Mass Action as it relates to chemical reactions 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	Distinguish between monosaccharides, disaccharides, and polysaccharides Explain why carbohydrates are important to living organisms Recognize the basic formula of a carbohydrate
Experiment: Starch	Perform investigations for presence of starch or sugar
Lipids	Explain why the variety of amino acids contributes to the variety of proteins Identify and describe the three types of lipids Recognize the vital functions of proteins to living organisms
Nucleic Acids	Describe the structure of DNA and RNA Distinguish between DNA and RNA
Enzymes	Describe the action of enzymes in living organisms Explain why enzymes are vital to living organisms
Experiment: Digestion	Perform investigations to explore the action of enzymes on digestion

Biology

Unit 3: CELLS

Lesson Title

The Cell-An Introduction	Evaluate the two cell theories Note differences between plant and animal cells Recognize cells as basic building blocks of life
Experiment: Microscope	Practice using a compound microscope
Experiment: Cheek Cells	Draw several of these cells and label the plasma membrane, cytoplasm, and nucleus. How are these cheek cells different from each other and how are they similar?
Experiment: 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: Osmosis	Date Experiment Done Date Report Completed Record your data Student Name
Organelles	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 Understand the process of glycolysis and the Krebs cycle for the production of ATP
Production of Needed Material	Define and differentiate between mitosis and meiosis Describe the structure and function of DNA found in the nuclei of cells Distinguish the differences between plant and animal cells Provide a brief explanation of the structure and function of the endoplasmic reticulum, ribosomes, and the Golgi bodies
Cells in Organisms	List in order the five levels of cellular organization Provide examples of specialized cells Recognize that, with each level, complexity increases
Experiment: Tissues	Observe several types of tissue cells using a microscope

Biology

Unit 4: CELL DIVISION AND REPRODUCTION

Lesson Title

Cell Division	Identify the result of mitosis Recognize the purpose of mitosis
Meiosis	Compare and contrast mitosis and meiosis Recognize the functions or purposes of meiosis Review the phases of meiosis
Stages of Mitosis	Define cytokinesis Identify and describe the stages of mitosis List and describe factors that affect the rate of mitosis
Experiment: Mitosis	Observe slides of onion root and roundworm for mitosis
Asexual Reproduction	Describe different means of asexual reproduction Discuss advantages of asexual reproduction
Experiment: Regeneration	Perform an experiment of regeneration on flatworms
Plants	Define the terms vascular and vegetative propagation Describe the different types of asexual reproduction in stems and provide examples Explain the asexual reproduction in bulbs and adventitious roots
Experiment: Bulb Structure	Using an onion, make observations of a bulb
Practical Applications in Plants	Describe and provide examples of methods used to grow plants asexually List the advantages of grafting
Experiment: Cuttings	Perform investigations of different types of cuttings
Sexual Reproduction	Discuss advantages of sexual reproduction Review sexual reproduction
Fertilization	Describe anisogamy and anisogametes Describe isogamy and isogametes Describe Oogamy and oogametes Distinguish the gametes producing organs in higher plants and animals Explain fertilization and conjugation
Experiment: Sexual Reproduction	Make observations of an egg cell and a sperm cell using prepared slides
Sexual Reproduction in Animals	Describe internal and external fertilization Distinguish between a haplontic and diplontic life cycle Recognize the importance of cell differentiation
Experiment: 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	Note the differences between the sporophyte and gametophyte generation Note the differences between the sporophyte and gametophyte generations Study the life cycle of the fern Study the life cycle of the pine as a gymnosperm
Experiment: Ferns and Pines	Prepare a slide of sporangia from a fern leaf and observe
Experiment: Flowers	Examine a variety of flowers and identify the parts

Biology

Unit 5: GENETICS: GOD'S PLAN OF INHERITANCE

Lesson Title

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 Distinguish between heterozygous, homozygous and alleles Distinguish between phenotype and genotype Identify the terms adopted to designate parents and generations
Probabilities	Recognize the relationship between random events and probability Relate probability of events to Mendel's principle of segregation using the seed experiment Understand the calculation of probability of independent events
Experiment: Probability	Perform an experiment on probability
Cross Predictions	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 multiple alleles and provide an example Describe the occurrence of incomplete dominance and provide an example
Chromosome Basis of Heredity	Define meiosis Distinguish between the haploid and diploid condition of chromosomes State Sutton's chromosome theory Understand why Sutton used <i>Drosophila</i> to study genetics
Chromosomes in Meiosis	Distinguish the differences between spermatogenesis and oogenesis Explain how crossing-over occurs Identify and describe the stages of meiosis
Sex Chromosomes	Discuss the discovery of sex-linked inheritance and provide an example Explain how nondisjunction may occur and provide an example Understand that the male chromosome is the sex determiner for most species
Molecular Genetics	Differentiate between DNA and RNA Identify the different types of RNA Explain the process of replication in DNA Distinguish between transcription and translation in DNA and RNA 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: 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	Discuss in detail the sex-linked trait of hemophilia 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	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 Identify the types of genetic testing done today Recognize the sensitivity of genetic testing for individuals and families

Biology

Unit 6: MICROBIOLOGY

Lesson Title

Microbial Taxonomy	List the kingdoms in the six-kingdom classification system. Identify which kingdoms are composed of prokaryotes and which are made up of eukaryotes.
Fungi	List and describe four phyla of fungi. Discuss what characteristics set organisms of a particular kingdom apart from members of other kingdoms. Discuss the structures and characteristics that allow scientists to place organisms in a particular group, such as a phylum within a kingdom.
Experiment: Fungus All Around (Part 1)	Grow and observe a number of different fungi.
Experiment: Fungus All Around (Part 2)	Yeast Observation
Animal-like Protists	Discuss the economic and environmental impact of some common animal-like protists. Trace the life cycle of some of the parasitic protists. Explain the purpose of the vector in diseases caused by zooflagellates. Describe some common forms of reproduction and/ or locomotion of the animal-like protists studied.
Experiment: Protozoan Culture	Grow and observe a number of different protozoans taken from a "dirty" water source.
Plant-like Protists (Algae)	List and describe seven phyla of plant-like protists (algae). Discuss the economic and environmental impact of algae. Explain some of the adverse effects caused by some plant-like protists. Describe some common forms of reproduction and/ or locomotion of the plant-like protists.
Fungus-like Protists	List and describe three phyla of fungus-like protists. Describe some common forms of reproduction and/ or locomotion of the fungus-like protists studied. Discuss the economic and environmental impact of some of the fungus-like protists.
Eubacteria	List and describe eubacteria based on Gram staining and shape. Discuss general characteristics of prokaryotic cells. Discuss the economic and environmental impact of eubacteria. Recognize the diseases associated with eubacteria.
Activity: Pathogenic Bacteria Report	Write a 750 word research report on a pathogenic bacterium that is not discussed in this unit.
Archaea	List and describe three groups of archaea. Discuss the economic and environmental impact of archaea
Viruses, Prions, and Viroids	List and describe the structures and characteristics of viruses, prions, and viroids. Discuss the economic and environmental impact of viruses, prions, and viroids. Recognize some of the diseases associated with viruses, prions, and viroids.
Experiment: Algae Observations	Examine prepared slides of nostoc and spirogyra.

Biology

Unit 7: PLANTS: GREEN FACTORIES

Lesson Title

How Is a Plant Made?	Distinguish how plant cells are similar and different from other cells List the various jobs that cells are capable of
Parts of the Plant Cell	Describe the structure and function of the chloroplasts in the plant cell Explain the function of the nucleus and the two structures found in the nucleus Recognize the function of the cell wall in plant cells Review the structure and function of the organelles found in the cytoplasm
Anatomy and Morphology	Describe the special tissues in a plant Discuss the basic reproductive method Identify the flower parts List and describe the five plant organs Understand how a tissue culture works
How do Plants Grow?	Compare and contrast the structures of a monocot and a dicot Differentiate between an annual and a perennial Follow the seedling development of a bean
Experiment: Seeds	Collect four different types of seeds and perform the investigation
Developmental Anatomy	Describe the elongation process of the root tip Discuss the differentiation of the plant cells Explain germination of a seed 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?' Understand and write the equation for photosynthesis
Photosynthesis: A Closer Look	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 importance of radioisotopes in discovering the processes of photosynthesis Understand the necessary components for the production of proteins by humans and animals
Experiment: Terrarium	Construct a terrarium
Respiration	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

Biology

Unit 8: HUMAN ANATOMY AND PHYSIOLOGY

Lesson Title

Digestive System	<ul style="list-style-type: none">Explain the purpose of villi in the small intestineExplain the two common conditions that disturb the function of the bowelsIdentify and describe the function of the organs of the digestive systemTrace the path that food takes through the digestive system
Excretory System	<ul style="list-style-type: none">Describe in detail the structure and function of the kidneysIdentify the two systems involved in excretion of wastesRecognize the importance of the kidneys
Respiratory System	<ul style="list-style-type: none">Describe the structure and function of the organs involved in the respiratory systemDifferentiate between external and internal respirationIdentify the function of the respiratory system
Circulatory System	<ul style="list-style-type: none">Describe the three groups of cells comprising the solid portion of bloodDistinguish between the solid and liquid portion of bloodIdentify the functions of the circulatory systemRecognize anemia and hemophilia as disorders of the bloodUnderstand the significance of blood types
The Heart	<ul style="list-style-type: none">Distinguish between the structures of the heart involved in pulmonary circulation and systemic circulationIdentify and describe the function of the lymphatic systemRecognize what the electrocardiogram is used forTrace the pathway blood circulates through heart, lungs, and body via the veins and arteriesUnderstand blood pressure readings
Experiment: Heart Rate	<ul style="list-style-type: none">Perform and experiment on heart rate
Body Framework	<ul style="list-style-type: none">Describe the structure of bones and cartilageIdentify the functions of the skeletal systemLocate and identify parts of the teeth and mouthLocate and identify the major bones in the bodyProvide examples of different kinds of joints
Muscular System	<ul style="list-style-type: none">Compare and contrast the movement of the skeletal muscles and the smooth musclesDescribe the action and components of a muscle fiberDifferentiate between the three muscle typesDistinguish between a tendon and ligamentIdentify disorders associated with the muscular system
Experiment: Muscle Types	<ul style="list-style-type: none">Observe slides of the three muscle types
Reproductive System	<ul style="list-style-type: none">Define sexual reproductionDiscuss the development of a mature egg (ovum) in a femaleDiscuss the production of sperm and semen in a maleExplain what occurs during fertilization
Environmental Interactions	<ul style="list-style-type: none">Describe the basic structure of a nerve cellDifferentiate between the parasympathetic and the sympathetic nervous systemIdentify and describe the different parts of the brainIdentify the divisions and functions of the nervous systemUnderstand the path of a reflex arc
Sensory Systems: The Eye	<ul style="list-style-type: none">Describe common vision problemsDescribe the functions of the structure of the eyeLocate the structures of the eyeTrace the path light takes upon entering the eye

Biology

Unit 8: HUMAN ANATOMY AND PHYSIOLOGY, CONTINUED

Lesson Title

Sensory Systems: Hearing, Taste, Touch	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	Describe the hormonal control of the pancreas and adrenal glands Describe the location and function of the thyroid and parathyroid glands and the hormones they secrete Explain the relationship and the hormonal control of the pituitary and the hypothalamus Explain the release of hormones from the ovaries and testes Identify common diseases and conditions of the thyroid and the pancreas
Immune System and Disease	Explain the three lines of defense a human body is capable of Explain why allergies occur List some major categories of disease

Biology

Unit 9: ECOLOGY, POLLUTION, AND ENERGY

Lesson Title

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	Evaluate the analogy of the balance of nature to a see-saw as an example of dynamic equilibrium Recognize that organisms containing chlorophyll are the first link in the food chain State the principles of ecology using the balance of nature concept State the principles of ecology using the food chain concept
Ecological Relationships	Explain how biomes are named by ecologists List and describe the maps that ecologists use to define biomes
Communities and Habitats	Distinguish between the terms biosphere, biomes, habitats, and communities Explain the use of ERTS-I by ecologists Provide examples of endangered species 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
Experiment: Habitats	Select a habitat and set up a living community
Experiment: Biomes	Explain what part of the ecosystem each living organism fulfills
Experiment: Quadrats	Choose a quadrat location and count and list different plant and animal species in the quadrat
Experiment: 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	Discuss and demonstrate strategies that will help solve the pollution problem Identify problems that create pollution Recognize the particles and chemicals that make up smog
Energy Affects Ecology	Differentiate between potential and kinetic energy Identify and describe different forms of energy Recognize and describe alternative energy sources Recognize the problems associated with the burning of fossil fuels Understand the importance of energy conservation
Essay: Stewardship	Locate Bible verses associated with our stewardship of the earth and rewrite each Bible verse using one's own interpretation

Biology

Unit 10: PRINCIPLES AND APPLICATIONS OF BIOLOGY

Lesson Title

Study of Life	Discuss the harmony between science and Scripture Identify limitations of the scientific method State and describe the steps of the scientific method
Definition of Life	Name common characteristics of living organisms
Basic Principles of Life	Define and describe the term homeostasis Examine the levels of organization in living organisms Recognize that diversity is the reason for taxonomy
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	Describe ways that we can be good stewards of the earth Identify how energy flows through an ecosystem Understand the many components of a food web
Applications of Biology	Assess the possible solutions to genetic disease Explain genetic counseling Name three types of immunity Review microorganisms and some of the diseases they cause
Green Revolution	Discuss how the world is addressing world hunger

Chemistry

Unit 1: MEASUREMENT AND ANALYSIS

Lesson Title

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

Chemistry

Unit 2: STARTING THE INVESTIGATION: HOW TO IDENTIFY ELEMENTS, COMPOUNDS, AND MIXTURES

Lesson Title

The Basic Ingredient: Chemical Elements	Differentiate between physical and chemical properties Know the symbols and spellings of the names of several common chemical elements Relate several facts from the development of chemical science
Using Chemical and Physical Properties to Identify Substances	Calculate density from direct and indirect measurements Identify a substance as organic or inorganic from its chemical formula Use density measurements to help identify an unknown substance Use the hardness scale to help identify an unknown substance
Experiment: Observations of a Phase Change	Identify differences in energy content of various phases and how these can be interpreted Interpret graphs produced from data collected during the phase change process
Experiment: 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	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: 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
Identifying Different Types of Mixtures	Differentiate between heterogeneous and homogeneous mixtures Differentiate between solute and solvent Relate differences between colloids, suspensions, and solutions and give examples of each Understand that the solution process involves a physical change
Experiment: 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

Chemistry

Unit 3: EXPLORING LAWS FOR GASES AND CONSERVATION OF MASS

Lesson Title

Nothing Stays Put - The Basis for Diffusion and Pressure	Define atomic weights as recorded on a periodic table Explain that the random motion of molecules causes the diffusion of gases State the relationship between the molecular weight of the diffusing material Understand that elastic collisions occurs without the loss of energy Relate that pressure is created by collisions
Gases and Kinetic Molecular Theory	Define and use the term 'triple point' Read from a phase diagram chart Relate the basic ideas of the Kinetic Molecular Theory
Project: Graphing Kinetic Energy	Apply the principles of Kinetic Molecular Theory to graphs of molecular motion
Pressure-Volume Relationships in Gases (Boyle's Law)	Be familiar with common units for pressure State the inverse relationship between pressure and volume in an ideal gas Solve problems using Boyle's Law
Temperature-Volume Relationships in Gases (Charles' Law)	Explain what temperature measures in a system Convert between Celsius and Kelvin temperature scales Explain the concept of absolute zero and the Kelvin temperature scale Solve problems using Charles' Law
Experiment: Finding Absolute Zero Experimentally	To organize data onto a graph To better understand the concept of extrapolation Visualize the relationship between the temperature and volume of a gas To evaluate, make inferences, and predict trends from data Communicate findings
Experiment: Charle's Law and a Metal Can	Describe experimental outcomes in terms of established laws
Project: Absolute Zero: Real or Theoretical?	Support your position with conclusions from research Use original sources to document findings concerning the research question
Combined Gas Law	Relate the values and meanings of 'standard temperature and pressure' Solve problems using the combined gas law
Counting Gas Particles: The Measure of the Mole	State Avogadro's Hypothesis 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 Relate that the atomic mass of any substance (expressed in grams) contains one mole of atoms Relate that the molar volume of any gas at STP is 22.4 L
How Big is a Mole? Avogadro's Number	Determine the number of particles in a given mass of a substance and its chemical formula State the value of Avogadro's number as 6.02×10^{23} and know that this is equal to one mole of particles Calculate the molecular or atomic weight (mass) of a substance from its chemical formula
Demonstrating Conservation of Mass with Balanced Equations	Identify products and reactants in chemical equations Relate the concept of conservation of mass 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: Biography	Research and describe the important contributions of investigators to the science of chemistry
Project: 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

Chemistry

Unit 4: THE DISCOVERY OF ATOMS: NATURE'S BUILDING BLOCKS

Lesson Title

The Golden Years of Chemistry	<p>Explain the early concept of the atom as described by Democritus</p> <p>Relate the experimental basis for Thompson's discovery of the electron</p> <p>Explain and apply the Law of Multiple Proportions as proposed by Dalton</p> <p>Relate the major contributions of the Curie's to the development of atomic theory</p>
Experiment: Physical Properties of Elements	<p>Devise investigative procedures, selecting appropriate equipment and technology</p> <p>Form a testable hypothesis</p> <p>Communicate findings</p> <p>Collect, analyze and display results of investigative procedures</p>
Experiment: Chemical Properties of Some Metals	<p>Form a testable hypothesis</p> <p>Collect, analyze and display results of investigative procedures</p> <p>Communicate findings</p>
Masters of Classic Atomic Theory	<p>Determine the atomic number and number of electrons of an element given its atomic mass</p> <p>Relate that Bohr's initial electron organizational atomic structure was determined by studying the spectra of simple atoms</p> <p>Relate the experimental basis for Rutherford's discovery of the nucleus</p> <p>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>Explain that Schrodinger extended the work of Bohr and deBroglie to develop the field of quantum mechanics</p>
Designing an Organizational Map: The Periodic Table	<p>Use the periodic table to identify metals, metalloids, nonmetals, and noble gases</p> <p>Explain the concept of periodicity</p> <p>Relate that the properties of an atom are mainly determined by the valence electrons</p> <p>Relate the position of an element in the periodic table to its atomic number and its atomic mass</p> <p>Understand the difference in trends between groups and families</p>
Charging Up: Ionization of Atoms	<p>Explain, based on properties of atoms, why periodic trends in ionization energy exist</p> <p>Use the periodic table to identify trends in ionization energy</p>
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> <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>
Report: Fission Reactors	<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>

Chemistry

Unit 5: MOLECULAR STRUCTURE

Lesson Title

Chemical Accounting: Stoichiometry	Calculate the answer. Check the significant figures in answer and round if needed.
Valence Structure	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	The formula would be written as follows: K_2S . To get two negative charges you need one S^{2-} ions because $1 \times 2^- = 2^-$, therefore the ratio of K^+ to S^{2-} is 2:1. To get two positive charges you need two K^+ ions because $2 \times 1^+ = 2^+$ If using potassium, K^+ and sulfide ion S^{2-} , the least common multiple of 1 and 2 is 2.
Electron Availability: Prelude to Bonding	Define electronegativity and relate its trends on the periodic table Define ionization energy and relate its trends on the periodic table
Types of Chemical Bonds	$KMnO_4$ is named potassium permanganate. $Co(OH)_3$ is named cobalt (III) hydroxide. $CaCrO_4$ is named calcium chromate. $Sr(ClO_2)_2$ is named strontium chlorite.
Polar Covalent Molecules and Dot Structures	Draw a dot structure of an element using its valence electrons Determine if a compound is polar based on symmetry
Experiment: Demonstrating Polar Properties	Describe experimental outcomes in terms of molecular shape and polarity Apply ideas to the findings of other scientists

Unit 6: SEMESTER REVIEW AND TEST

Lesson Title

Chemistry

Unit 7: CHEMICAL REACTIONS, RATES AND EQUILIBRIUM

Lesson Title

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>Give several indicators that suggest that a chemical reaction has occurred</p> <p>Distinguish between exothermic and endothermic processes given appropriate information in the balanced equation</p>
Experiment: Observing Chemical Changes	<p>What do you observe?</p> <p>What is your hypothesis for the observations and changes?</p>
Enthalpy of Reaction	<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>
Using Gibbs Free Energy to Predict Spontaneous Reactions	<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: 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>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> <p>Describe the use of catalysts to lower activation energy</p> <p>Explain that all reactions require at least a small amount of activation energy</p>
Reaction Equilibriums and Equilibrium Constants	<p>Write an equilibrium expression from a balanced chemical equation</p> <p>Determine from the value of an equilibrium constant, whether reactants or products are favored</p> <p>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</p>
Activity: Exploring Factors that Affect Equilibrium	<p>Evaluate experimental results showing equilibria shifts due to temperature change</p>
Conditions Affecting Equilibrium	<p>Apply LeChatelier's Principle in cases where equilibrium is stressed by concentration, temperature, pressure or volume</p>

Chemistry

Unit 8: EQUILIBRIUM SYSTEMS

Lesson Title

Chemist's Toolbox	Observe significant figure rules in all calculations Solve problems concerning moles, gram formula weights, and balanced equations
Solutions	Explain the relationship between the concentration of the solute in a solution and the freezing point depression or the boiling point elevation Relate that solutions can exist in three phases, solid, liquid or gaseous Understand that solutions are homogeneous mixtures of two or more substances
Solution Concentration: Molarity	Make dilution calculations from original stock solutions Calculate the concentration of the solute in terms of molarity
Electrical Nature of Solutions	Relate that acids, bases, and salts are three types of compounds that form electrolytes in solution Understand that covalent compounds must both dissociate and ionize to form electrolytic solutions, whereas ionic compounds only need to dissociate
Solubility	List factors that influence the solubility of a solute in a solvent Predict the number of ions a solute may contribute to a solution
The Dissolving Process	Describe the dissolving process at the molecular level
Experiment: 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: 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
pH Scale	Relate that the ion product of water (K_w) is a constant equal to 10^{-14} Do calculations of pH from hydrogen ion or hydroxide ion concentration Use the pH scale to characterize a solution as acidic, basic, or neutral
Titration of Acids and Bases	Understand that the process of neutralization leads to the formation of salt and water Do calculations using the method of titration in determining the concentration of an unknown acid/base
Redox Equilibria	Determine the oxidized and reduced species in a reaction Determine the oxidizing and reducing agent in a reaction
Redox and Oxidation Potentials	Understand that on the list of oxidation potentials, any reactant will act as an oxidizing agent for any agent above it Assign oxidation numbers to all members of a compound
Activity: Solution Concentration vs. Conductivity	Graph experimental data and interpret results for peer review
pH Calculations	Perform pH calculations using a calculator

Chemistry

Unit 9: CARBON CHEMISTRY: HYDROCARBONS

Lesson Title

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	Describe how fractional distillation is used to separate petroleum fractions List some sources natural sources of organic compounds and the major products from each
Experiment: Volatility	Form a testable hypothesis concerning the relative volatility of the solvents being investigated Collect, analyze and display results of investigative procedures Do research to extend the application of these results to practical circumstances
A Closer Look at the Carbon Atom	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, i.e., 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	State that the most important chemical reaction of alkanes is combustion Understand the concept of structural isomers Use the naming system for the first ten compounds in the alkane series Explain that saturated hydrocarbons have all carbons bonded to 4 other atoms Relate that alkanes are chemically fairly unreactive
Unsaturated Hydrocarbons	Relate the basic nature of cyclic compounds, such as benzene State that the family of hydrocarbons with triple bonds is known as the alkynes State that the family of hydrocarbons with double bonds is known as the alkenes Relate that unsaturated hydrocarbons have fewer than 4 bonds to other atoms 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

Chemistry

Unit 10: CARBON CHEMISTRY: FUNCTIONAL GROUPS

Lesson Title

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 aromatic hydrocarbons (benzene) undergoes substitution Explain that unsaturated chain hydrocarbons undergo addition reactions to become saturated Relate that DDT is an important substituted aromatic hydrocarbon
Alcohols	Explain the basic process by which alcohols are manufactured Name several important industrial alcohols Recognize the hydroxyl functional group
Aldehydes, Acids, and Ketones	State that aldehydes contain the functional group -CHO , and formaldehyde 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 State that the carboxylic acids contain the -COOH group and formic acid is a common example of this class of chemicals
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 amides is -CONH_2 and explain that amides provide the structural link in proteins State that the functional group of an primary amine is -NH_2 , and list several uses of amines Use the naming framework to derive a name for a particular amide Use the naming framework to derive a name for a particular amine
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: Preparation of a Polymer	Evaluate scientific data Develop questions from an initial investigation

Chemistry

Unit 11: CHEMISTRY REVIEW

Lesson Title

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 converting numbers to and from scientific notation Review rules for manipulating significant figures
Elements, Compounds, and Mixtures	Review examples of chemical properties of substances such as combustion Review examples of physical properties of substances such as density Review indicators to differentiate between various types of mixtures (solutions, colloids and suspensions)
Gases and Moles	Review calculating molecular weights Review ideas pertaining to gases, Boyle's and Charles' Law, Avogadro's Hypothesis, Molecular Kinetic Theory Review solving molar mass problems based on balanced equations Review solving problems using Boyle's and Charles' Law and the combined gas law
Atomic Structure and Nuclear Reactions	Review balancing nuclear equations Review information that can be determined about an atom from a periodic table entry Review the basic structure of the atom Review the significance of fission and fusion reactions Review the three natural forms of radiation that occur during the decay process and their inherent dangers
The Periodic Law	Review the concept that energy is released when electrons move from one energy level to a lower one 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 trends that occur on the periodic table such as in ionization energy and electron affinity
Molecular Structure	Review determining chemical formulas for compounds using information about the placement of an element on the periodic table Review determining the identity of an element from its electron configuration Review the idea that unequal sharing of electrons causes covalent bonds to become polar Review the internal difference between different types of bonds, such as covalent, metallic and ionic
Chemical Reactions, Rates, and Equilibrium	Review recognizing signs that a chemical reaction has occurred Review the concept of heat of enthalpy and determining exothermic and endothermic reactions
Reaction Dynamics	Review predicting what adjustment a system that is in equilibrium will make when stressed Review various methods for calculating solution concentration Review writing equilibrium constants from balanced equations
Solutions	Review the idea that some solutes make electrolytic solutions 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 relationship between the concentration of the solute and the freezing point depression or boiling point elevation of a solution
Solubility Equilibrium	Review how to interpret values of K_{sp} for a solution Review physical and chemical properties of acids and bases Review the relationship between the pH of a solution and the hydrogen ion concentration

Chemistry

Unit 11: CHEMISTRY REVIEW, CONTINUED

Lesson Title

Neutralization	Review determining which reactants undergo oxidation and which undergo reduction Review the concept that acids and bases combine in a neutralization reaction to form water and salt Review the idea that titration is often used to find concentration in an acid-base system Review the significance of the ion product of water (K_w) and that it is always equal to 10^{-14}
Organic Compounds	Review naming patterns for saturated and unsaturated straight chain families (alkanes, alkenes and alkynes) Review natural sources of carbon compounds 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

Unit 12: SEMESTER REVIEW AND TEST

Lesson Title

Physics

Unit 1: KINEMATICS

Lesson Title

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

Physics

Unit 2: DYNAMICS

Lesson Title

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: Isaac Newton	Indicate contributions that made an impact historically and how that science is still being used today Research and describe the important contributions of investigators to the science of physics
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: 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: Explosion	Communicate results Plan and implement an investigative procedure to verify the validity of the conservation of momentum laws Research and compare to previous findings using similar mechanisms Analyze data and present findings for peer review
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: 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: 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

Physics

Unit 3: WORK AND ENERGY

Lesson Title

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: Nuclear Energy	<p>Describe connections between the various branches of science involved in the nuclear question (physics, chemistry, and biology)</p> <p>Evaluate the impact of scientific research and technology on society and the environment</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: Simple Machines	<p>Communicate findings</p> <p>Analyze, evaluate and predict patterns from data</p> <p>Make quantitative observations and measurements with precision</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> <p>State that there are four phases of matter</p>
Latent Heat	<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: 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>
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>

Physics

Unit 4: INTRODUCTION TO WAVES

Lesson Title

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: 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: Pulses	<p>Communicate conclusions</p> <p>Analyze and predict trends from data</p> <p>Formulate a testable hypothesis concerning how pulses transfer energy</p> <p>Make qualitative observations</p>
Wave Phenomena	<p>Describe wave characteristics such as reflection, refraction, diffraction and interference</p>
Experiment: 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: Bending Waves	<p>Analyze, evaluate and predict trends from data</p> <p>Make quantitative observations and measurements at the appropriate level of precision</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: Doppler Effect	<p>Make qualitative observations of a moving source producing regular pulses</p> <p>Communicate findings</p>

Physics

Unit 5: LIGHT

Lesson Title

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: 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: 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 Solve problems using the lens equation and its corollaries
Experiment: Convergence	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 Solve problems using the lens equation and its corollaries
Light Phenomena and Models of Light	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: 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 6: SEMESTER REVIEW AND EXAM

Lesson Title

Physics

Unit 7: STATIC ELECTRICITY

Lesson Title

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 $1.6 \cdot 10^{-19}$ Coulombs
Experiment: 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 State that Ohm's Law relates voltage, current and resistance; $V=IR$
Electric Potential	Electric fields have units of volts/meter or newtons/coulomb When a charge moves through an electric field energy is expended and work is done
Potential and Energy	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

Physics

Unit 8: ELECTRIC CURRENTS

Lesson Title

Sources of EMF	Realize that originally current was thought to be the flow of positive charges Understand that in an electric current, electrons flow from a source of high potential to an area of lower potential 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
Project: Research and Report	Describe connections between the fields of physics, chemistry and biology having to do with this study Research and describe the impact of early electrical theorists on the development of society, economics and technology
Fluid Flow	Understand that conductance of a conduit is directly proportional to its cross-sectional area and inversely proportional to its length Solve problems concerning conductance Realize that if resistance to flow is too great, current will stop
Resistance	Realize that electrical work is done only when electrons are forced by a source of emf against a resistance Understand that resistance is a function length, cross-sectional area, and resistivity (which is determined by the geometric electrical structure) of the resisting material State that conductance is the reciprocal of resistance Solve problems involving resistance and conductance
Ohm's Law	Know that Ohm's Law relates voltage or source of EMF, current, and resistance; $V = IR$ Use Ohm's Law to solve problems Become familiar with symbols for simple circuit elements
Circuits	Differentiate between circuit diagrams of series and parallel circuits 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 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 Apply and solve problems using Ohm's Law to a series circuit Apply and solve problems using Ohm's Law to a parallel circuit Apply Watt's Law for power in both series and parallel circuits

Physics

Unit 9: MAGNETISM

Lesson Title

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>
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> <p>State that magnetic field strength is measured in teslas</p>
Electromagnetism	<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>
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>

Physics

Unit 10: ATOMIC AND NUCLEAR PHYSICS

Lesson Title

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: 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>
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> <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>
Nuclear Reactions	<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>

Physics

Unit 10: ATOMIC AND NUCLEAR PHYSICS, CONTINUED

Lesson Title

Fusion and Applications of Nuclear Energy	Realize that fusion reactions in the sun join hydrogen atoms to create helium and the release of energy Understand that nuclear reactions of many types are useful in medical, biological, and physical science Understand the basic structure of a fission nuclear power plant
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Unit 11: REVIEW

Lesson Title

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 Review solving problems involving Kepler's laws
Energy	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 and properties of charged particles Review the sources magnetic fields
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 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
Circuits	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
Modern Physics	Review the history of atomic theory including the work of Thomson, Milliken, Rutherford, Geiger and Marsden Review the supporting spectral evidence for the planetary model of the atom first envisioned by Rutherford Review the refinements to the electron orbital structure called for by the experiments of Bohr, Plank, Hertz and Einstein Recall features of the atomic model that support the particle theory of light

Physics

Unit 11: REVIEW, CONTINUED

Lesson Title

The Bohr Atom

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

Recall that the momentum of each energy level must be some multiple of Planck's constant

Recall that the circumference of each energy level must be some integral multiple of the electron's deBroglie wavelength

Duality

Recall that all moving objects produce waves called deBroglie waves whose wavelength are defined by the momentum of the particle

Review the application and foundations of the Heisenberg Uncertainty Principle

Nuclear Energy

Review the relationship between neutrons and isotopes of an element

Review the relationship between mass defect and binding energy

Recall the three natural decay products of an unstable nucleus, gamma rays, alpha and beta particles and some of their effects

Review the half-life calculation for radioactive isotopes

Unit 12: SEMESTER REVIEW AND EXAM

Lesson Title