KINDERGARTEN SCIENCE

STANDARDS AND INSTRUCTION GUIDE

2025

MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.K.1	The student will develop investigation and reasoning skills by:	a. Observing, describing, and identifying basic properties of objects (size, color, texture) through direct observation.	
_____			b. Using observations to explore patterns in the natural world, comparing data across multiple perspectives.	
_____			c. Classifying objects based on single attributes (e.g., color, size) and sequencing them by size.	
_____			d. Constructing simple charts and graphs, with an emphasis on data collection to support inquiry.	
_____			e. Formulating questions, making predictions, and recording observations through drawings or simple models.	
_____			f. Recognizing unexpected results and discussing alternative explanations, supporting early scientific argumentation skills.	

MONITORING ✓	LIFE SCIENCES: LIVING SYSTEMS, STRUCTURE, FUNCTIONS AND ECOSYSTEMS	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.K.2	The student will explore the needs and interdependent relationships of living things:	a. Identifying the five senses, associated organs, and how each sense helps us understand our environment.	
_____			b. Exploring what plants and animals need to survive (e.g.. plants need light, water; animals need food, water).	
_____			c. Describing how organisms, including humans, modify their environment to meet needs (e.g., squirrels burying food, humans using resources).	
_____			d. Recognizing similarities between offspring and parents and introducing basic life cycles of plants and animals.	
_____			e. Observing and describing basic patterns and relationships in the natural world (e.g., daily routines of animals, plant growth patterns)..	

MONITORING ✓	EARTH AND SPACE SCIENCE, WEATHER AND PATTERNS	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.K.3	The student will investigate weather, seasonal changes, and environmental interactions:	a. Observing and recording weather conditions daily, noting patterns over time (e.g., sunny, rainy, warm).	
_____			b. Exploring how weather changes with seasons and how these changes affect plant and animal behaviors.	
_____			c. Using models (e.g., charts, simple drawings) to represent weather patterns and make predictions.	
_____			d. Learning how sunlight affects Earth's surface, observing shadow changes as a simple introduction to energy transfer.	
_____			e. Understanding the purpose of weather forecasting for preparation and response to seasonal changes.	
_____	S.K.4	The student will understand basic astronomy concepts:	a. Observe the sun, moon, stars, and clouds and describe their properties and movements.	

_____			b. Understand that shadows are created when sunlight is blocked by an object.	
_____			c. Recognize that the sun provides light and warmth essential for life on Earth.	
MONITORING ✓	**PHYSICAL SCIENCES – MATTER AND MOTION**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.K.5	The student will explore properties of matter and forces that influence motion:	a. Identifying and describing physical properties (color, shape, size, texture) and categorizing them by state (solid, liquid, gas).	
_____			b. Compare the states of matter (solid, liquid, gas) using everyday examples	
_____			c. Investigating how pushes and pulls (forces) can affect an object's motion, speed, or direction.	
_____			d. Comparing the effects of different strengths and directions of pushes/pulls on objects.	

_____			e. Using nonstandard measurement to describe the relative size, weight, or volume of objects.	
_____			f. Exploring simple ways to reduce sunlight's warming effects (e.g., using shade structures), introducing basic engineering solutions.	
MONITORING ✓	**ENVIRONMENTAL AWARENESS AND CONSERVATION**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.K.6	The student will develop an understanding of environmental conservation:	a. Observing and discussing human impacts on land, water, air, and other living things in the local environment.	
_____			b. Learning about recycling and reusing everyday materials to reduce waste.	
_____			c. Identifying actions that conserve resources (e.g., turning off lights, conserving water).	

_____			d. Communicating simple solutions to reduce environmental impact, such as reusing or recycling paper, bottles, and cans	
_____			e. Water and energy conservation at home and in school helps ensure resources are available for future use	
_____	S.K.7	The student will investigate and understand basic needs and life processes of plants and animals. Concepts include:	a. Animals need adequate food, water, shelter, air and space to survive	
_____			b. Plants need nutrients, water air, light and a place to grow to survive	
_____			c. Plants and animals change as they grow, have varied life cycles and eventually die	
_____			d. Offspring of plants and animals are similar but not identical to their parents or to one another	

FIRST GRADE SCIENCE

STANDARDS AND INSTRUCTION GUIDE

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MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.1.1	With teacher guidance, the student will plan and conduct investigations in which:	a. differences in physical properties are observed using the senses and simple instruments to enhance observations (magnifying glass, thermometer, ruler, balance)	
_____			b. observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy	
_____			c. length, mass, volume and temperature are measured using standard and nonstandard units	
_____			d. objects or events are classified and arranged according to characteristics or properties	
_____			e. a question is developed from one or more observations	
_____			f. observations and data are communicated orally and with simple graphs, pictures, written statements and numbers	

_____			g. inferences are made and conclusions are drawn about familiar objects and events	
_____			h. predictions are based on patterns of observation rather than random guesses	
_____			i. simple experiments are conducted to answer questions	
MONITORING ✓	**PHYSICAL SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.1.2	The student will explore the properties and interactions of sound, light, and motion. Concepts include:	a. objects may vibrate and produce sound; changing the rate of vibration changes the pitch of the sound	
_____			b. Describe how objects can be seen only when illuminated	
_____			c. Test how placing objects of different materials affects light's path	
_____			d. the position of an object can be described by locating it relative to another object or to the background	
_____			e. objects may have straight, circular and back and forth motions	

_____			f. pushes and pulls can change the motion of an object; the change is related to the strength of the motion	
MONITORING ✓	**EARTH SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.1.3	The student will explore and investigate the basic relationship of the sun and the earth.	a. the sun is the source of energy and light that warms the land, air and water	
_____			b. the rotation of the Earth causes night and day	
_____			c. objects in the sky have patterns of movement (sun rises in the east and sets in the west; monthly phases of the moon result in observable changes in its shape)	
_____	S.1.4	The student will investigate and understand weather and seasonal changes. Concepts include:	a. changes in temperature, light and precipitation affect plants and animals, including humans	
_____			b. there are relationships between daily and seasonal changes	
_____			c. changes in temperature, light and precipitation can be observed and recorded over time	

_____	S.1.5	The student will be able to identify and discuss the ways living things affect and are affected by the environment. Concepts include:	a. identification and use of natural resources (renewable and non-renewable)	
_____			b. conservation of resources (recycling, reusing and reducing consumption)	
_____			c. factors that affect the quality of land air and water (pollution)	
MONITORING ✓	**LIFE SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.1.6	The student will identify and describe the basic needs and structures of plants. Concepts include:	a. needs of plants: air, water, light, nutrients and a place to grow	
_____			b. observations of structures: seeds, roots, stems, leaves, flowers	
_____			c. seeds develop into plants, then flowers and then fruits which contain seeds	
_____			d. characteristics of plants: flowering/non-flowering, evergreen/deciduous, edible/non-edible	
_____			e. seasonal changes	

_____	S.1.7	The student will identify and describe the basic needs and structures of animals. Concepts include:	a. needs of animals: air, nutrients, water, a place to grow (habitat) and shelter	
_____			b. physical characteristics: shape, size, locomotion and appendages	
_____			c. classify animals according to one or more properties	
_____			d. seasonal adaptations (hibernation, camouflage and migration)	
_____	S.1.8	The student will be able to identify the basic characteristics and needs of the human body. *1.8 can be skipped ONLY if/when Health is covered by a separate teacher. Concepts include:	a. appendages and major organs (heart, lungs, brain and stomach)	
_____			b. nutritional requirements for a healthy active lifestyle (ChooseMyPlate.gov)	
_____			c. hygiene needs: teeth (structure, care, correlation of diet), hand washing	
_____			d. seasonal needs: clothing, shelter	

SECOND GRADE SCIENCE

STANDARDS AND INSTRUCTION GUIDE

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MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.2.1	Students will develop skills in scientific inquiry, using tools and methods to explore the natural world:	a. Make observations and predictions and form questions.	
_____			b. Differentiate between observations and personal interpretations.	
_____			c. Repeat observations to ensure accuracy.	
_____			d. Measure length, volume, mass, and temperature in metric units (centimeters, meters, liters, degrees Celsius, grams, kilograms) and standard English units (inches, feet, yards, cups, pints, quarts, gallons, degrees Fahrenheit, ounces, pounds).	
_____			e. Classify items using two or more characteristics or properties.	

_____			f. Collect, record, and analyze data using pictures, bar graphs with numbered axes, and simple charts.	
_____			g. Draw and communicate conclusions.	
_____			h. Identify variables and conditions that influence experiments.	
_____			i. Construct simple physical models.	
MONITORING ✓	**PHYSICAL SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.2.2	Students will investigate properties of matter	a. Understand that matter has mass, takes up space, and has observable and measurable properties (color, shape, texture, size, density).	
_____			b. Explore how matter is composed of substances, including parts too small to see without magnification.	

_____			c. Recognize that physical properties remain the same as the size of a substance is reduced.	
_____			d. Identify and classify solids, liquids, and gases based on their characteristics.	
_____			e. Explore how temperature changes states of matter (e.g., evaporation, condensation, melting, freezing, boiling).	
_____			f. Understand how matter expands or contracts with temperature changes (e.g., water expansion when frozen).	
_____			g. Create and separate mixtures using tools and methods such as strainers, filters, and evaporation.	
_____			h. Investigate interactions of substances with water, including solubility and temperature effects.	
_____			i. Understand how substances like soap or detergent change water's behavior.	

_____	S.2.3	Students will investigate properties of light	a. Recognize that light is necessary for sight and travels in straight lines.	
_____			b. Explore refraction (using prisms to separate white light into the visible spectrum) and reflection (using mirrors).	
_____			c. Identify the colors of the visible spectrum (red, orange, yellow, green, blue, indigo, violet).	
_____	S.2.4	Students will investigate properties of sound	a. Investigate properties of sound as vibrations and how sound travels through different materials.	
_____	S.2.5	Students will investigate properties of magnetism	a. Students will learn and understand that a force is a push or a pull.	
_____			b. Students will learn how to apply a force that can change the speed or direction of an object's motion.	

_____			c. Students will learn and identify different types of matter (solids, liquids, and gases) that can respond differently to forces.	
_____			d. Students will learn and understand that forces help explain why objects move or stay still.	
_____			e. Understand that magnets attract certain metals (iron, steel) and repel like poles.	
_____			f. Explore different magnet shapes (horseshoe, bar, rod, ring) and strength variations.	
_____			g. Learn about compasses and Earth's magnetic field.	
MONITORING ✓	**EARTH SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.2.6	Students will explore weather, natural resources, and Earth's systems.	a. Observe, measure, and record daily weather conditions (sunny, cloudy, windy, rainy, snowy)	

_____			b. Use thermometers to measure temperature in both metric and English units.	
_____			c. Describe types of precipitation (rain, snow, sleet, hail) and how weather data helps predict future conditions.	
_____			d. Identify and describe important natural resources, including water, minerals, rocks, ores, plants, animals, forests, soil, and energy sources.	
_____			e. Understand the significance of watersheds and the conservation of natural resources.	
_____			f. Explore slow changes to Earth's surface (e.g., erosion, weathering) and rapid changes (e.g., earthquakes, volcanic eruptions).	

MONITORING ✓	LIFE SCIENCE	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.2.7	The student will investigate and understand that animals and plants go through a series of changes in their life cycle.	a. Explore the life cycles of plants and animals, recognizing patterns of growth and development.	
_____			b. Identify animals that go through distinct stages (e.g., butterfly, frog) and those that do not.	
_____			c. Examine the effects of weather and seasonal changes on life cycles and behaviors.	
_____			d. Recognize that living organisms depend on their environment for food, water, shelter, and space.	
_____			e. Understand the interdependence between living and nonliving elements in ecosystems.	
_____			f. Explore how habitats change over time due to natural or human influences.	

_____			g. Learn how plants provide oxygen, food, and habitats for animals.	
_____			h. Investigate plant needs (sunlight, water, nutrients) and their adaptations to different environments.	
_____			i. Study the interdependence between plants, animals and their environment.	

THIRD GRADE SCIENCE

STANDARDS AND INSTRUCTION GUIDE

2025

MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.3.1	The student will consider and apply the following: :	a. predictions and observations are made	
_____			b. objects with similar characteristics are classified into at least two sets and two subsets	
_____			c. questions are developed to formulate hypotheses	
_____			d. data are gathered, charted, graphed, analyzed and communicated (line plot, picture graph and bar graph)	
_____			e. inferences are made and conclusions are drawn	
_____			f. volume is measured to the nearest milliliter and liter	
_____			g. length is measured to the nearest centimeter	

_____			h. mass is measured to the nearest gram	
_____			i. temperature is measured to the nearest degree Celsius	
_____			j. time is measured to the nearest minute using analog/digital clock	
_____			k. natural events are sequenced chronologically	
_____			l. models are designed and built when relevant	
MONITORING ✓	**PHYSICAL SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.3.2	The student will investigate and understand characteristics and interactions of moving objects.	a. Motion is described by an object's direction and speed;	
_____			b. Forces cause changes in motion;	
_____			c. Friction is a force that opposes motion; and	
_____			d. Moving objects have kinetic energy.	

_____	S.3.3	The student will identify simple machines and their uses. Concepts include:	a. push and pull (forces)	
_____			b. Ramps	
_____			c. Wedges	
_____			d. levers	
_____			e. screws	
_____			f. wheels and axles	
_____			g. pulleys (fixed and movable)	
MONITORING ✓	**EARTH SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.3.4	The student will investigate and understand the water cycle and its relationship to life on Earth. Concepts include:	a. there are many sources of water on Earth	
_____			b. the energy of the sun drives the water cycle	

_____			c. the water cycle involves several processes (evaporation, condensation, precipitation)	
_____			d. water is essential for living things	
_____			e. water on Earth is limited and needs to be conserved	
_____	S.3.5	The student will investigate and understand the major components of soil, its origin and importance to plants and animals including humans. Concepts include:	a. soil provides the support and nutrients necessary for plant growth	
_____			b. topsoil is a natural product of subsoil and bedrock	
_____			c. rock, clay, silt, sand and humus are components of soils	
_____			d. soil is a natural resource and should be conserved	

_____	S.3.6	The student will investigate and understand that natural events and human influences can affect the survival of species. Concepts include:	a. the interdependency of plants and animals	
_____			b. the effects of human activity on the quality of air, water and habitat	
_____			c. the effects of fire, flood, disease and erosion on organisms	
_____			d. conservation of resources (renewable: sunlight, water, wind; nonrenewable: coal, oil, natural gas, wood, nuclear)	
MONITORING ✓	**LIFE SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.3.7	The student will develop an understanding and appreciation of ecosystems and how they function. Concepts include:	a. living and non-living components of ecosystems	
_____			b. gathering and storing food	

_____			c. Shelter (habitat)	
_____			d. Biodiversity	
_____			e. fresh water ecosystems (explore at least one: pond, marshland, swamp, steam, river)	
_____			f. terrestrial ecosystems (explore at least one: desert, grassland, rainforest, forest)	
_____	S.3.8	The student will develop an understanding of food chains and food webs. Concepts include:	a. sun is the initial source of energy	
_____			b. energy is passed from organism to organism	
_____			c. producers, consumers and decomposers	
_____			d. herbivores, carnivores and omnivores	
_____			e. predator, prey	

_____			f. aquatic and terrestrial food chains	
_____	S.3.9	The student will investigate and understand that adaptations allow animals to satisfy life needs and respond to the environment. Concepts include:	a. behavioral adaptations (reflex, instinct, migration, hibernation)	
_____			b. physical adaptations (defense, camouflage)	
_____	S.3.10	The student will investigate and understand the processes of basic digestion and elimination. Concepts include: *Note: This may overlap with the Health Curriculum H.3.1 “Body Systems”	a. organs and function of the digestive system	
_____			b. organs and function of the excretory system	

MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.4.1	The student will plan and conduct guided investigations in which:	a. Asking questions and defining problems • Identify scientific and non-scientific questions. • Develop hypotheses as cause-and-effect relations. • Define a simple design problem that can be solved through the development of an object, tool, process, or system.	
_____			b. Planning and carrying out investigations • Identify variables when planning an investigation. • Collaboratively plan and conduct investigations. • Use tools and/or materials to design and/or build a device that solves a specific problem. • Take metric measurement using appropriate tools. • Measure elapsed time.	
_____			c. Interpreting, analyzing, and evaluating data • Organize and represent data in bar graphs and line graphs.	

			• Interpret and analyze data represented in bar graphs and line graphs. • Compare two different representations of the same data (e.g., a set of data displayed on a chart and a graph). • Measure elapsed time.	
_____			d. Constructing and critiquing conclusions and explanations • Use evidence (i.e., measurements, observations, patterns) to construct or support explanations and to make inferences.	
_____			e. Developing and using models • Develop and/or use models to explain natural phenomena. • Identify limitations of models.	
_____			f. Obtaining, evaluating, and communicating information • Read and comprehend reading-level-appropriate texts and/or other reliable media. • Communicate scientific information, design ideas, and/or solutions with others.	

MONITORING ✓	PHYSICAL SCIENCE	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.4.2	The student will investigate and understand the characteristics of electricity. Concepts include:	a. Simple electromagnets and magnetism	
_____			b. Static electricity	
_____			c. Electrical energy can be transformed into light and motion to produce heat.	
_____			d. Safety in handling electrical circuits and material	
_____			e. Conductors and insulators	
_____			f. Parallel and series circuits	
_____			g. Construct simple circuits using dry cell batteries.	
_____			h. Historical contributions in understanding electricity (Benjamin Franklin, Thomas Edison, Hertha Ayrton, Nikola Tesla, and Alessandro Volta)	

MONITORING ✓	EARTH SCIENCE	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.4.3	The student will investigate and understand that weather conditions and phenomena affect ecosystems and can be predicted. Key ideas include:	a. Weather measurements create a record that can be used to make weather predictions.	
_____			b. How common and extreme weather events affect ecosystems.	
_____			c. Long term seasonal weather trends determine the climate of a region.	
_____	S.4.4	The student will investigate and understand that the planets have characteristics and a specific place in the solar system. Key ideas include:	a. Planets rotate on their axes and revolve around the sun.	
_____			b. Planets have characteristics and a specific order in the solar system.	
_____			c. The sizes of the sun and planets can be compared to one another.	

_____	S.4.5	The student will investigate and understand the relationships between Earth, the moon, and the sun. Key relationships include:	a. The motions of Earth, the moon, and the sun	
_____			b. The causes for Earth's seasons	
_____			c. The causes of the four major phases of the moon and the relationship to the tide cycles	
_____			d. The relative size, position, age, and makeup of Earth, the moon, and the sun	
MONITORING ✓	**LIFE SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.4.6	The student will investigate and understand basic plant anatomy and life processes. Concepts include:	a. the structure of typical plants (leaves, stems, roots, and flowers) and their functions	
_____			b. processes and structures involved with reproduction (pollination, stamen, pistil, sepal, embryo, spore and seed)	

_____			c. photosynthesis (sunlight, chlorophyll, water, carbon dioxide, oxygen, and sugar)	
_____			d. dormancy as a response to the plant's environment	
_____	4.7	The student will investigate and understand the structure and basic functions of the circulatory system. **Concepts** include:	a. heart, arteries, veins, capillaries and blood b. transport of oxygen and carbon dioxide c. transport energy (food) and waste d. disease control (white blood cells) e. bone marrow and red blood cells f. the path of circulation	
_____	S.4.8	The student will investigate and understand the basic structure and function of the respiratory system. **Concepts** include:	a. nose, pharynx, tracheae, bronchi, lungs and alveoli b. exchange of oxygen and carbon dioxide c. effects of smoking on the lungs	
_____	S.4.9	The student will investigate and understand the basic structure and function of the nervous system **Concepts** include:	a. brain, spinal cord b. voluntary muscle control and reflexes c. senses d. safety issues regarding head injuries (bike helmets, etc.) e. effects of drugs on the brain and nervous system	

_____	S.4.10	The student will investigate and understand that organisms, including humans, interact with one another and with the nonliving components in the ecosystem. Key ideas include:	a. Interrelationships exist in populations, communities, and ecosystems.	
_____			b. Food webs show the flow of energy within an ecosystem.	
_____			c. Changes in an organism's niche and habitat may occur at various stages in its life cycle.	
_____			d. Classification can be used to identify organisms.	
_____	S.4.11	The student will investigate and understand that the ocean environment has characteristics. Key characteristics include:	a. Geology of the ocean floor	
_____			b. Physical properties and movement of ocean water	
_____			c. Interaction of organisms in the ocean	
_____			d. The functioning of the ocean as an ecosystem	

SOLAR SYSTEM	CURRICULUM GUIDELINES	CORE CONCEPTS
S.4.12	The student will investigate and understand the organization of the solar system. Key concepts include:	a. The planets in the solar system.
		b. The order and relative sizes of the planets.
		c. The relationship between the Sun, Earth, and Moon, including phases, tides, and eclipses.
		d. The causes for Earth's seasons and the phases of the Moon.
		e. Historical contributions to astronomy (e.g., Copernicus, Galileo, Newton).

FIFTH GRADE SCIENCE

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MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.5.1	The student will plan and conduct investigations in which:	a. rocks and organisms are identified using various classification keys	
_____			b. estimations of length, mass, volume and temperature are made	
_____			c. appropriate instruments are selected and used for making accurate observations of length, mass, volume, elapsed time and temperature; cells are viewed using microscope	
_____			d. accurate SI measurements are made using basic tools (thermometer, meter stick, balance, graduated cylinder, stopwatch)	
_____			e. constants as well as independent and dependent variables are identified	
_____			f. data are collected, recorded and reported using the appropriate graphical representation (graphs, charts, diagrams)	
_____			g. predictions are made using patterns and simple graphical data are extrapolated	

_____			h. models are constructed to clarify explanations, demonstrate relationships and solve needs	
_____			i. Numerical data that are contradictory or unusual in experimental results are recognized.	
_____			j. inferences are made and conclusions are drawn	
_____			k. Results are communicated verbally, graphically, and in writing.	
_____			l. an understanding of the nature of science is developed and reinforced	
MONITORING ✓	**PHYSICAL SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.5.2	The student will investigate and understand that matter is anything that takes up space and has mass. Concepts include:	a. matter has physical and chemical properties that can be measured	
_____			b. atoms are the building blocks of all matter (include proton, neutron, electron, nucleus)	

_____			c. atoms make up molecules	
_____			d. elements, compounds, mixtures including solutions	
_____			e. distinguishing properties of each phase of matter	
_____			f. atoms are always in motion, adding or removing heat will cause atoms to move faster or slower	
_____			g. effect of temperature on state of matter	
MONITORING ✓	**ENERGY**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.5.3	The student will investigate and understand that energy is a property of many substances. Key concepts include:	a. potential and kinetic energy	
_____			b. energy can take many forms including, thermal, light, electrical, mechanical motion, sound, nuclear and chemical	

_____			c. energy transformations (heat/light to mechanical, chemical and electrical energy)	
_____			d. the role of the sun in the formation of most energy sources on Earth	
_____			e. nonrenewable energy sources (fossil fuels including petroleum, natural gas, nuclear and coal)	
_____			f. renewable energy sources (wood, wind, hydro, geothermal, tidal and solar)	
_____			g. a limited number of elements comprise the largest portion of the solid Earth, living matter, the oceans and the atmosphere	
_____	S.5.4	The student will investigate and understand how sound is transmitted and is used as a means of communication. Concepts include:	a. compression/longitudinal waves (rare faction)	
_____			b. vibration, frequency, pitch, amplitude	
_____			c. the ability of different media (solids, liquids and gases) to transmit sound	
_____			d. uses and applications (voice, sonar, animal sounds and musical instruments)	

_____			e. structure of the ear and mechanics of hearing	
_____	S.5.5	The student will investigate and understand basic characteristics of visible light. Concepts include:	a. the visible spectrum and light waves (transverse)	
_____			b. opaque, transparent and translucent	
_____			c. refraction of light through water and prisms	
_____			d. reflection of light from reflective surfaces (mirrors)	
_____			e. structure of the eye and mechanics of sight	
MONITORING ✓	**LIFE SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.5.6	The student will investigate and understand the structures and functions of the internal skeletal system and muscular system of the human body. *5.6 can be skipped ONLY if/when Health is covered by a separate teacher. Concepts include:	a. skeletal system's primary functions include provides shape and support, protects internal organs, works with muscular system to move	
_____			b. cartilage, ligaments, tendons and joints (ball and socket, hinge and pivot)	

_____			c. voluntary, involuntary and cardiac muscle	
_____			d. nutrients, exercise and rest are needed to keep the skeletal and muscular systems healthy	
_____			e. drugs are chemicals that can cause a change in almost any part of the body	
_____	S.5.7	The student will identify plants as being vascular or non-vascular. Concepts include:	a. simple plants (mosses) have no vessels	
_____			b. vascular plants include ferns that produce spores and seed plants that are either flowering or non-flowering	
_____			c. transpiration is the passage of water through a plant	
MONITORING ✓	**ECOSYSTEMS**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.5.8	The student will investigate and understand interactions in a biological community. Concepts include:	a. the relationships among producers, consumers and decomposers in food webs	

_____			b. the relationship between predators and prey	
_____			c. energy flow in food webs and energy pyramids	
_____			d. competition, cooperation, social hierarchy and territorial imperative within a population	
_____			e. symbiotic relationships	
_____			f. niches	
_____	S.5.9	The student will investigate and understand how organisms adapt to biotic and abiotic factors in an ecosystem. Concepts include:	a. differences between ecosystems and biomes	
_____			b. characteristics of land, freshwater and marine ecosystems	
_____			c. adaptations that enable organisms to survive within a specific ecosystem	
_____			d. complex relationships within land, freshwater and marine ecosystems	

_____			e. the carbon, water and nitrogen cycles	
_____	S.5.10	The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and respond to daily, seasonal and long-term changes in their environment. Concepts include:	a. phototropism, hibernation and dormancy	
_____			b. factors that increase or decrease population size	
_____			c. eutrophication, climate changes and catastrophic disturbances	
_____	S.5.11	The student will investigate and understand the relationships between ecosystem dynamics and human activity. Concepts include:	a. food production and harvest	
_____			b. change in habitat size, quality or structure	
_____			c. change in species competition	
_____			d. population disturbances and factors that threaten or enhance species survival	

_____			e. review of environmental issues (water supply, air quality, energy production and waste management)	
MONITORING ✓	**EARTH SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.5.12	The student will investigate and understand how weather conditions and events occur and can be predicted. Key concepts include:	a. Temperature, air pressure, fronts, and humidity.	
_____			b. Formation and types of clouds.	
_____			c. Formation of storms (hurricanes, tornadoes, cyclones).	
_____			d. Tools for measuring weather: barometer, thermometer, anemometer, rain gauge, and hygrometer.	

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MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.6.1	The student will plan and conduct investigations in which:	a. observations are made involving fine discrimination between similar objects and organisms	
_____			b. precise and approximate measurements are recorded	
_____			c. scale models are used to estimate distance, volume and quantity	
_____			d. hypotheses are stated in ways that identify the independent (manipulated) and dependent (responding) variables	
_____			e. a method is devised to test the validity of predictions and inferences	
_____			f. data are collected, recorded, analyzed and reported using appropriate metric measurements	
_____			g. data are organized and communicated through graphical representation (graphs, charts and diagrams)	

_____			h. models are designed to explain a phenomenon	
_____			i. an understanding of the nature of science is developed and current applications are used to reinforce science concepts	
_____			j. one variable is manipulated over time, using many repeated trials	
MONITORING ✓	**ENVIRONMENTAL SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.6.2	The student will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere and on the Earth's surface. Concepts include:	a. Earth's energy budget (balance of solar energy entering and leaving Earth)	
_____			b. the role of radiation and convection in the distribution of Earth's energy	
_____			c. the motion of the atmosphere and the oceans	
_____			d. cloud formation	
_____			e. the role of thermal energy in weather-related phenomena including thunderstorms and hurricanes	

_____	S.6.3	The student will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. Concepts include:	a. air as a mixture of gaseous elements and compounds	
_____			b. air pressure, temperature and humidity	
_____			c. Earth's atmospheric layers and how pressure and temperature changes with altitude	
_____			d. natural and human-caused changes to the atmosphere	
_____			e. the relationship of atmospheric measures and weather conditions	
_____			f. basic information from weather maps including fronts, systems and basic measurements	
_____			g. air quality's role in human health and environment.	
_____	S.6.4	The students will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Concepts include:	a. water as the universal solvent	

_____			b. the properties of water in all three states	
_____			c. the action of water in physical and chemical weathering	
_____			d. the ability of large bodies of water to store heat and moderate climate	
_____			e. the importance of water for agriculture, power generation and public health	
_____			f. the importance of protecting and maintaining water resources	
_____	S.6.5	The student will investigate and understand the natural processes and human interactions that affect watershed systems. Concepts include:	a. the health of ecosystems and the abiotic factors of a watershed	
_____			b. the location and structure of Virginia's regional watershed systems	
_____			c. divides, tributaries, stream processes, rivers, and lakes.	
_____			d. wetlands	
_____			e. estuaries	

_____			f. monitoring and analysis using field equipment including hand-held technology	
_____			g. major conservation, health, and safety issues associated with watersheds	
_____	S.6.6	The student will investigate and understand environmental issues. Concepts include:	a. management of renewable resources (water, air, soil, plant life, animal life)	
_____			b. management of nonrenewable resources (coal, oil, natural gas, nuclear power, mineral resources)	
_____			c. the mitigation of land-use and environmental hazards through preventive measure	
_____			d. cost/benefit tradeoffs in conservation policies	
MONITORING ✓	**EARTH SCIENCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.6.7	The student will investigate the earth's surface.	a. surface layers include lithosphere, hydrosphere, atmosphere	

_____			b. Earth's structure consisting of a crust (including the ocean floor), mantle and core	
_____			c. rocks are classified by how they are formed; the rock cycle	
_____			d. geological history, topics include fossils, carbon dating	
_____			e. Earth's landscape includes mountains, valleys, caves, glaciers, floodplains, deltas and sand dunes	
_____	S.6.8	The student will investigate and understand how Earth's surface is constantly changing. Concepts include:	a. Continental drift, Pangea, and plate tectonic theory explains the movement and changes of the Earth's crust	
_____			b. geological changes may be sudden or gradual	
_____			c. earthquakes and volcanoes, as well as how they might be predicted	
_____			d. surface changes are caused by weathering, erosion and deposition	
_____			e. weathering may be physical or chemical	

_____			f. natural agents of change are water (running water, groundwater, waves, glaciers) and wind	
_____			g. human impact on the physical features of the Earth	
MONITORING ✓	**EARTH SPACE SYSTEMS**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.6.9	The student will review the organization of the solar system and the relationships among the various bodies that comprise it. Concepts include:	a. the sun, moon, Earth, other planets and their moons, meteors, dwarf planets, asteroids and comets	
_____			b. relative size of and distance between planets	
_____			c. Formation of the Solar System (Nebular Theory and the role of gravity)	
_____	S.6.10	Students will understand the interrelationship of the earth, sun and moon.	a. revolution and rotation	
_____			b. the mechanics of day and night and the phases of the moon	

_____			c. the unique properties of Earth as a planet	
_____			d. the relationship of the Earth's tilt and the seasons	
_____			e. the cause of tides	
_____			f. the history and technology of space exploration	
_____			g. solar and lunar eclipses	
_____	S.6.11	Students will investigate and understand scientific concepts as they relate to evolution of the universe.	a. Fr. Lemaitre's Big Bang Theory on the birth of the universe.	
_____			b. Life cycle of stars	
_____			c. Star systems and galaxies	
_____			d. The history and technology of space exploration	

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MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.7.1	The student will plan and conduct investigations in which:	a. data are organized into tables showing repeated trials and means	
_____			b. variables are defined	
_____			c. metric units (SI—International System of Units) are used	
_____			d. models are constructed to illustrate and explain phenomena	
_____			e. sources of experimental error are identified	
_____			f. dependent variables, independent variables and constants are identified	
_____			g. variables are controlled to test hypotheses and trials are repeated	
_____			h. continuous line graphs are constructed, interpreted and used to make predictions	

_____			i. interpretations from a set of data are evaluated and defended	
_____			j. an understanding of the nature of science is developed and current applications are used to reinforce life science concepts	
_____			k. a classification system is developed based on multiple attributes	
_____			l. instruments, such as simple compound light microscopes, triple beam and electronic balances, thermometers, metric rulers, graduated cylinders and probeware are used to make observations and measurements	
_____	S.7.2	The student will demonstrate the ability to select design and implement an independent research project by participating in a Science Fair or national contest or in a competition requiring independent scientific research.		

MONITORING ✓	LIFE SCIENCE	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.7.3	The student will define and explain life, its origin and its processes. Concepts include:	a. spontaneous generation and the disproof of this theory	
_____			b. biogenesis and the proof of this theory	
_____			c. use of energy	
_____			d. growth and development	
_____			e. Ability to adapt	
_____			f. respiration	
_____			g. reproduction	
_____			h. response to stimuli	
_____	S.7.4	The student will investigate and understand that all living things are composed of cells. Concepts include:	a. cell structure and organelles	

_____			b. similarities and differences between plant and animal cells	
_____			c. development of cell theory	
_____			d. cell division – mitosis and meiosis	
_____			e. construct a cell model	
_____			f. living things show patterns of cellular organization: cells, tissues, organs and systems	
_____	S.7.5	The student will investigate and understand cell functions and processes. Concepts include:	a. movement of materials across cell membranes, including: passive and active transport, osmosis and selective permeability	
_____			b. the basic physical and chemical processes of photosynthesis and its importance to plant and animal life, including energy transfer between sunlight and chlorophyll, transformation of water and carbon dioxide into sugar and oxygen;	

			and photosynthesis as the foundation of virtually all food webs	
_____			c. cellular respiration	
_____			d. Cellular respiration and photosynthesis as part of the carbon cycle.	
_____	S.7.6	The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Concepts include:	a. historical contributions and significant discoveries related to genetics (for example, Rosalind Franklin, Watson, and Crick and Gregor Mendel)	
_____			b. structure and role of DNA	
_____			c. function of genes and chromosomes	
_____			d. dominant and recessive traits	
_____			e. genotypes and phenotypes	
_____			f. Punnett squares	

_____			g. characteristics that can and cannot be inherited	
_____			h. genetic engineering and its applications such as disease therapy and agriculture (enrichment)	
_____	S.7.7	The student will investigate and understand that populations of organisms change over time. Concepts include:	a. the relationships of mutation, adaptation, natural selection and extinction	
_____			b. evidence of evolution of different species in the fossil record	
_____			c. how environmental influences, as well as genetic variation, can lead to diversity of organisms	
_____	S.7.8	The student will define, classify and describe the basic characteristics of the domains and kingdoms of living organisms. Basics characteristics include 1) number of cells in the organism, 2) method of obtaining food, 3) whether or not they move, 4) the presence or absence of a	a. the distinguishing characteristics of domains of organisms (Archaea, Eubacteria, Eukaryotes)	

		nucleus in their cells. Concepts may include:		
_____			b. the distinguishing characteristics of kingdoms of organisms; (Archaebacteria, Eubacteria, Protists, Fungi, Plants, Animals)	
_____			c. the basic characteristics of major animal phyla (cnidarians, annelids, arthropods, echinoderms, mollusks and chordates) and plant divisions (mosses, ferns, conifers, angiosperms)	
_____			d. the characteristics that define a species	
_____			e. dichotomous key	
_____			f. binomial nomenclature	
_____			g. viruses	

_____	S.7.9	The student will investigate and understand that organisms interact with other members of a population and with its environment. Concepts include:	a. the carbon, water and nitrogen cycles	
_____			b. interactions resulting in a flow of energy and matter throughout the system	
_____			c. complex relationships within terrestrial, freshwater and marine ecosystems	
_____			d. energy flow in food webs and energy pyramids	
_____			e. competition, cooperation, social hierarchy, territorial imperative	
_____			f. influence of behavior on a population	
_____	S.7.10	The student will define and explain the process of growth and development and life span of the human. Concepts include:	a. embryo, fetus, neonate, infant, childhood, adolescence and adult	

_____			b. behavioral and developmental expectations	
_____			c. endocrine system role in development and growth	
_____	S.7.11	The student will understand the process of reproduction of the human. This unit could be integrated with, or taught as, the Family Life Unit of Religion. **Be SURE to check your school policy prior to instructing this objective. Refer to the Formation of Christian Chastity policy.**		

EIGHTH GRADE SCIENCE

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MONITORING ✓	SCIENTIFIC INVESTIGATION, REASONING AND LOGIC	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.8.1	The student will plan and conduct investigations in which:	a. chemicals and equipment are used safely	
_____			b. length, mass, volume, density, temperature, weight and force are accurately measured and reported using metric units (SI—International System of Units)	
_____			c. conversions are made among metric units, applying appropriate prefixes	
_____			d. triple beam and electronic balances, thermometers, metric rulers, graduated cylinders and spring scales are used to gather data	
_____			e. numbers are expressed in scientific notation where appropriate	
_____			f. research skills are utilized using a variety of resources	
_____			g. independent and dependent variables, constants, controls and repeated trials are identified	

_____			h. data tables showing the independent and dependent variables, derived quantities and the number of trials are constructed and interpreted	
_____			i. data tables for descriptive statistics showing specific measures of central tendency, the range of the data set and the number of repeated trials are constructed and interpreted	
_____			j. frequency distributions, scattergrams, line plots and histograms are constructed and interpreted	
_____			k. valid conclusions are made after analyzing data	
_____			l. research methods are used to investigate practical problems and questions	
_____			m. experimental results are presented in appropriate written form	
_____			n. models and simulations are constructed and used to illustrate and explain phenomena	
_____			o. an understanding of the nature of science is developed and current applications of physical science are used to reinforce concepts	

MONITORING ✓	CHEMISTRY	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.8.2	The student will investigate and identify the characteristics of matter. Concepts include:	a. solid, liquid, gas, plasma	
_____			b. elements, compounds and mixtures (solutions, suspensions and colloids)	
_____			c. Inorganic and organic molecules and compounds	
_____			d. acids, bases and salts	
_____			e. lipids, carbohydrates, proteins	
_____			f. physical properties: shape, density, color, odor, boiling point, melting point, solubility and miscibility	
_____			g. chemical properties: acidity, basicity, pH, combustibility, reactivity	

_____	S.8.3	The student will investigate and explain the history of atomic theory and the structures of the atom. Concepts include:	a. the historical development of atomic theory (including Dalton, Thomson, Rutherford and Bohr)	
_____			b. Bohr model and electron cloud model (modern model of the atom)	
_____			c. nucleus, proton, neutrons, electrons	
_____			d. ions	
_____			e. isotopes	
_____	S.8.4	The student will obtain and explain information from the Periodic Table of Elements. Concepts include:	a. symbol, atomic number and atomic mass	
_____			b. metals, non-metals, metalloids and noble gases	
_____			c. chemical families (groups) and periods	
_____			d. oxidation number	
_____			e. synthetic elements	

_____	S.8.5	The student will analyze the Periodic Table of Elements and will develop correct inferences regarding elements and binary compounds. Concepts include:	a. formation of compounds through ionic and covalent bonding	
_____			b. formulas for compounds	
_____			c. names of compounds	
_____	S.8.6	The student will investigate and explain chemical changes of matter using the theory of conservation of matter and energy. Concepts include:	a. evidence of reaction	
_____			b. reactants and products	
_____			c. types of reactions	
_____			d. balanced chemical equations	
_____	S.8.7	The student will investigate and understand temperature scales, heat and thermal energy transfer and its relation to the kinetic theory. Concepts include:	a. Celsius and Kelvin temperature scales and absolute zero	

_____			b. phase change, freezing point, melting point, boiling point, vaporization and condensation	
_____			c. conduction, convection and radiation	
_____			d. applications of thermal energy transfer	
_____	S.8.8	The student will research and discuss nuclear changes in matter using the theory of conservation of matter and energy. Concepts include:	a. fusion and fission	
_____			b. products of nuclear reactions	
_____			c. effects on humans and the environment	
_____			d. alternative energy sources, including renewable and non-renewable.	
MONITORING ✓	**MOTION AND FORCE**	**CURRICULUM GUIDELINES**	**CORE CONCEPTS**	**RESOURCES**
_____	S.8.9	The student will investigate and understand the scientific principles of motion and the forces that affect it. Concepts include:	a. speed, velocity and acceleration	

_____			b. net force	
_____			c. friction	
_____			d. gravity and centripetal force	
_____			e. Newton's laws of motion	
_____			f. deriving SI unit for force	
_____	S.8.10	The student will define and explain work. Concepts include	a. work	
_____			b. deriving SI unit for work	
_____			c. power	
_____			d. simple machines and complex machines	
_____			e. mechanical advantage and efficiency	
_____			f. Use simple and complex machines to apply systematic methods to compare different engineering solutions.	

MONITORING ✓	ENERGY	CURRICULUM GUIDELINES	CORE CONCEPTS	RESOURCES
_____	S.8.11	The student will investigate and understand basic principles of electricity and magnetism. Concepts include:	a. static electricity, current electricity and circuits	
_____			b. relationship between a magnetic field and an electric current as well as factors that affect the strength of electric and magnetic forces including voltage and resistance	
_____			c. electromagnets, motors and generators and their uses	
_____			d. conductors, semiconductors and insulators	
_____	S.8.12	The student will investigate and explain the basic characteristics of transverse waves. Concepts include:	a. wavelength, frequency, speed, amplitude, crest and trough	
_____			b. the wave behavior of light	
_____			c. images formed by lenses and mirrors	

_____			d. the electromagnetic spectrum	
_____			e. technological applications of light	
_____	S.8.13	The student will investigate and explain the basic characteristics of sound waves. Concepts include:	a. wavelength, frequency, speed, amplitude, rarefaction and compression	
_____			b. resonance	
_____			c. the nature of compression waves	
_____			d. technological applications of sound.	