K-HS Science Learning Progressions

Science Learning Progressions

*The science content described for the grade-spans K–2, 3–5, or 6–8 may be taught in one or more grades within these grade-spans in the order indicated by this progression.

The Nature of Science: Inquiry and Habits of Mind

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.A.1.1.1	Identify a scientific fact as something that can be observed using the five senses.	■						
S K-2.A.2.1.1	Understand that making a change to an investigation may change the outcome(s) of the investigation.	●						
S K-2.A.2.1.2	Describe outcomes of an investigation.	●						
S K-2.A.2.2.1	Identify simple tools that can be used in an investigation (e.g., measuring cup, hand lens, ruler, balance scale, thermometer).	●						
S3.A.1.1.1	Distinguish between fact and opinion.	▫	■					
S3.A.2.1.1	Identify the variables in a simple investigation.	▫	■					
S3.A.2.1.2	Make predictions based on observations.	▫	■					
S3.A.2.1.3	Generate questions about objects, organisms, or events that can be answered through scientific investigations.	▫	■					
S3.A.2.2.1	Identify appropriate tools or instruments for specific tasks, and describe the information they provide (i.e., measuring [length—ruler; mass—balance scale] and making observations [hand lenses—very small objects]).	▫	●					
S4.A.1.1.1	Distinguish between a scientific fact and an opinion, providing clear explanations that connect observations and results (e.g., a scientific act can be supported through making observations).		▫ ■					
S4.A.1.3.1	Observe and record change by using time and measurement.		▫ ■					
S4.A.1.3.2	Describe relative size, distance, or motion.		▫ ■					
S4.A.1.3.3	Observe and describe the change to objects caused by heat, cold, or light.		▫ ■					
S4.A.1.3.4	Explain what happens to a living organism when its food supply, access to water, shelter, or space is changed (e.g., they might die, migrate, change behavior, eat something else).		▫ ■					
S4.A.1.3.5	Provide examples, predict, or describe how everyday human activities (e.g., solid waste production, food production and consumption, transportation, water consumption, energy production and use) may change the environment.		▫ ■					
S4.A.2.1.1	Generate questions about objects, organisms, or events that can be answered through scientific investigations.		▫ ●					
S4.A.2.1.2	Design and describe an investigation (a fair test) to test one variable.		▫ ●					
S4.A.2.1.3	Observe a natural phenomenon (e.g., weather changes, length of daylight/night, movement of shadows, animal migrations, growth of plants), record observations, and then make a prediction based on those observations.		▫ ●					
S4.A.2.1.4	State a conclusion that is consistent with the information/data.		▫ ●					
S4.A.2.2.1	Identify appropriate tools or instruments for specific tasks and describe the information they can provide (e.g., measuring: length-ruler, mass-balance scale, volume-beaker, temperature-thermometer; making observations: hand lens, binoculars, telescope).		▫ ●					
S5.A.1.1.1	Explain how certain questions can be answered through scientific inquiry and/or technological design (e.g., Investigate to find out if all clay or foil boats designs react the same when filled with paperclips).		▫ ■					
S5.A.1.1.2	Explain how observations and/or experimental results are used to support inferences and claims about an investigation or relationship (e.g., Make a claim based on information on a graph).		▫ ■					
S5.A.1.1.3	Describe how explanations, predictions, and models are developed using evidence.		▫ ■					
S5.A.2.1.1	Design a simple, controlled experiment (fair test) identifying the independent and dependent variables, how the dependent variable will be measured and which variables will be held constant (e.g., relate the effect of variables [mass, release height, length of string] to number of swings of a pendulum, investigate the relationships among variables in paper airplane designs).		▫ ■					
S5.A.2.1.2	Describe relationships among variables through interpretation of data and observations (i.e., make predictions for the outcome of a controlled experiment using data tables and graphs).		▫ ■					
S5.A.2.2.1	Describe the appropriate use of instruments and scales to accurately measure time, mass, distance, volume, and temperature safely under a variety of conditions (e.g., use a thermometer to observe and compare the interaction of food coloring in water at different temperatures).		▫ ■					
S6.A.1.1.1	Explain how certain questions can be answered through scientific inquiry and/or technological design (e.g., consumer product testing, common usage of simple machines, modern inventions).		▫	■				
S6.A.1.1.2	Use evidence to support inferences and claims about an investigation or relationship (e.g., common usage of simple machines).		▫	■				
S6.A.1.1.3	Predict the outcome of an experiment based on previously collected data.		▫	■				
S6.A.1.2.1	Use evidence, observations, or explanations to make inferences about change in systems over time.		▫	■				
S6.A.2.1.1	Use evidence, observations, or a variety of scales to describe relationships.		▫	■				
S7.A.1.1.1	Distinguish between a scientific theory and a general opinion, explaining how a theory is supported with evidence.			▫ ■				
S7.A.1.1.2	Develop questions that can be answered through scientific inquiry and/or technological design.		▫	▫ ●				
S7.A.1.1.3	Use evidence such as observations or experimental results to support inferences.		▫	▫ ●				
S7.A.1.1.4	Use evidence to develop descriptions, explanations, and models.		▫	▫ ■				
S7.A.2.1.1	Use evidence from investigations to clearly describe relationships and communicate and support conclusions.		▫	▫ ●				
S7.A.2.2.1	Describe the safe and appropriate use of instruments and scales to accurately and safely make measurements under variety of conditions.			▫ ●				
S7.A.2.2.2	Apply measurement systems to record and interpret observations under a variety of conditions.		▫	▫ ■				
S8.A.1.1.2	Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/ information may change existing theories and practice.			▫ ■				
S8.A.1.1.3	Use evidence, such as observations or experimental results, to support inferences about a relationship.		▫	▫ ●				
S8.A.1.1.4	Develop descriptions, explanations, predictions, and models using evidence.			▫ ■				
S8.A.1.2.4	Identify environmental issues and explain their potential long-term health effects (e.g., pollution, pest controls, vaccinations).			▫ ■				
S8.A.1.3.1	Use ratio to describe change (e.g., percents, parts per million, grams per cubic centimeter).			▫ ■				
S8.A.2.1.1	Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.			▫ ■				
S8.A.2.1.2	Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.			▫ ■				
S8.A.2.1.3	Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.			▫ ■				
S8.A.2.1.4	Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.		▫	▫ ■				
S8.A.2.1.5	Use evidence from investigations to clearly communicate and support conclusions.			▫ ■				
S8.A.2.2.1	Describe the appropriate use of instruments and scales to accurately measure time, mass, distance, volume, or temperature safely under a variety of conditions.			▫ ■				
S8.A.2.2.2	Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.			▫ ■				
S8.A.3.3.1	Explain how certain questions can be answered through scientific inquiry and/or technological design.		▫	▫ ■				

The Nature of Science: Systems, Patterns, and Models

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.A.3.1.1	Describe a system as being made of multiple parts that work together.	●						
S3.A.3.1.1	Classify systems as either human-made or natural (e.g., human-made systems [balancing systems, tops, wheel and axle systems, pencil sharpeners from manual to electric] and natural systems [plants, animals, water cycle, stream]).	▫	●					
S3.A.3.1.2	Identify change in natural or human-made systems.	▫	●					
S3.A.3.2.1	Identify what models represent (e.g., simple maps showing mountains, valleys, lakes, and rivers; dioramas).	▫	●					
S4.A.3.1.4	Categorize systems as either natural or human-made (e.g., ballpoint pens, simple electrical circuits, plant anatomy, water cycle).		▫ ●					
S4.A.3.1.3	Explain a relationship between the living and nonliving components in a system (e.g., food web, terrarium, bicycle).		▫ ■					
S4.A.3.1.2	Categorize the parts of an ecosystem as either living or non-living and describe their roles in the system.		▫ ●					
S4.A.3.1.1	Identify the parts of the food and fiber systems as they relate to agricultural products from the source to the consumer.		▫ ●					
S4.A.3.2.1	Identify what different models represent (e.g., maps show physical features, directions, distances; globes represent Earth; drawings of watersheds depict terrain; dioramas show ecosystems; concept maps show relationships of ideas).		▫ ■					
S4.A.3.2.2	Use models to make observations to explain how systems work (e.g., water cycle, sun-Earth-moon system).		▫ ●					
S4.A.3.2.3	Use appropriate, simple modeling tools and techniques to describe or illustrate a system (e.g., two cans and string to model a communications system, terrarium to model an ecosystem).		▫ ■					
S4.A.3.3.1	Identify and describe observable patterns (e.g., growth patterns in plants, weather, water cycle).		▫ ■					
S4.A.3.3.2	Predict future conditions/events based on observable patterns (e.g., day/night, seasons, sunrise/sunset, lunar phases).		▫ ●					
S5.A.3.1.1	Make predictions based on patterns in natural systems (e.g., phases of the moon, time [day, month, and year], weather, seasons).		▫ ●					
S5.A.3.2.1	Describe how models are used to better understand the relationships in natural systems (e.g., water cycle, Sun-Earth-Moon, ecosystems, observe and draw a diagram to show the effects of flowing water in a watershed).		▫ ●					
S6.A.1.2.2	Identify variables that cause change in natural or human-made systems.		▫	■				
S6.A.2.1.2	Identify variables that cause change in natural or human-made systems.		▫	■				
S6.A.3.1.1	Describe a system as a group of related parts with specific roles that work together to achieve an observed result.		▫	●				
S6.A.3.1.2	Explain how components of natural and human-made systems play different roles in a working system.		▫	■				
S6.A.3.2.1	Describe how scientists use models to explore relationships and make predictions about natural systems (e.g., weather conditions, the solar system).		▫	●				
S7.A.1.3.1	Describe how variables can cause changes in a system over time.		▫	▫ ●				
S7.A.1.3.2	Use evidence, observations, or explanations to make inferences about change in systems over time (e.g., carrying capacity, succession, fossil evidence in the geologic time scale).		▫	▫ ●				
S7.A.3.1.1	Describe a system (e.g., ecosystem, circulatory system, agricultural system) as a group of related parts with specific roles that work together to achieve an observed result.		▫	▫ ●				
S7.A.3.1.2	Explain concept of order in a system (e.g., first to last manufacturing steps, trophic levels; simple to complex: levels of biological organization from cell to organism).		▫	▫ ■				
S7.A.3.1.3	Distinguish among system inputs, system processes, system outputs, and system feedback.		▫	▫ ■				
S7.A.3.1.4	Identify examples of open- and closed-looped systems.			▫ ■				
S7.A.3.2.1	Make inferences based on scientific models (e.g., charts, graphs, diagrams).		▫	▫ ●				
S7.A.3.2.2	Describe how engineers use models to develop new and improved technologies to improve scientific study and/or human life.		▫	▫ ■				
S7.A.3.3.1	Describe patterns as repeated processes or recurring elements in natural and human-made systems.			▫ ■				
S8.A.1.1.1	Identify and describe patterns as repeated processes or recurring elements in human-made systems (e.g., triangles in bridges, hub and spoke system in communications and transportation systems, feedback controls in regulated systems).			▫ ●				
S8.A.1.3.2	Use evidence, observations, or explanations to make inferences about change in systems over time (e.g., carrying capacity, succession, population dynamics, loss of mass in chemical reactions, indicator fossils in geologic time scale) and the variables affecting these changes.			▫ ●				
S8.A.1.3.3	Examine systems changing over time, identifying the possible variables causing this change, and drawing inferences about how these variables affect this change.			▫ ■				
S8.A.1.3.4	Given a scenario, explain how a dynamically changing environment provides for the sustainability of living systems.		▫	▫ ●				
S8.A.3.1.1	Describe a system (e.g., watershed, circulatory system, heating system, agricultural system) as a group of related parts with specific roles that works together to achieve an observed result.			▫ ●				
S8.A.3.1.2	Explain the concept of order in a system (e.g., first to last–manufacturing steps; trophic levels; simple to complex–cell, tissue, organ, organ system).			▫ ●				
S8.A.3.1.3	Distinguish between system inputs, system processes, system outputs, and feedback (e.g., physical, ecological, biological, informational).			▫ ■				
S8.A.3.1.4	Distinguish between open loop (e.g., energy flow, food web, open-switch) and closed loop (e.g., materials in the nitrogen and carbon cycles, closed-switch) systems.			▫ ■				
S8.A.3.1.5	Explain how components of a natural and human-made system play different roles in a working system.			▫ ●				
S8.A.3.2.1	Describe how scientists use models to explore relationships in natural systems (such as an ecosystem, river system, or the solar system).			▫ ■				
S8.A.3.2.2	Describe how engineers use models to develop new and improved technologies to solve problems.			▫ ■				
S8.A.3.2.3	Given a model showing simple cause and effect relationships in a natural system, predict results that can be used to test the assumptions in the model. (e.g., photosynthesis, water cycle, diffusion, infiltration).		▫	▫ ■				
S8.A.3.3.2	Describe repeating structure patterns in nature(e.g., veins in a leaf, tree rings, , crystals, water waves) or periodic patterns (e.g., daily, monthly, annually).			▫ ●				

The Nature of Science: Advancements in Science and Technology

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.A.1.1.2	Identify examples of technology.	●						
S K-2.A.1.1.3	Describe how technology can help people (e.g., home appliances, phones, computers, transportation).	●						
S3.A.1.1.2	Identify examples of common technological changes past and present in the community (e.g., energy production, transportation, communication, recycling).	▫	●					
S4.A.1.1.2	Identify and describe examples of common technological changes past to present in the community (e.g., energy production, transportation, communications, agriculture, packaging materials) that have either positive or negative impacts on society or the environment.		▫ ■					
S5.A.2.2.2	Explain how technology extends and enhances human abilities for specific purposes (e.g., use hand lens to examine crystals in evaporation dishes, use graduated cylinders to measure the amount of water used in a controlled plant experiment).		▫ ●					
S6.A.2.2.1	Describe ways technology extends and enhances human abilities for specific purposes (e.g., make observations of cells with a microscope, planets with a telescope).		▫	●				
S7.A.1.2.1	Describe the positive and negative effects (both intended and unintended) of scientific results or technological developments.		▫	▫ ■				
S7.A.2.1.2	Identify a design flaw in a simple technological system and devise possible working solutions.			▫ ●				
S7.A.2.2.3	Describe ways technology is used to enhance scientific study and/or human life.			▫ ■				
S8.A.1.2.1	Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments.(e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants).		▫	▫ ●				
S8.A.1.2.2	Explain society's standard of living in terms of technological advancements and their impact on agriculture. (e.g., transportation, processing, production, storage)		▫	▫ ■				
S8.A.1.2.3	Describe fundamental scientific or technological concepts that could solve practical problems.(e.g., Newton's Laws of motion, Mendelian genetics, mechanical advantage).		▫	▫ ■				
S8.A.2.1.6	Identify a design flaw in a simple technological system and devise possible working solutions.		▫	▫ ■				
S8.A.2.2.3	Describe ways technology extends and enhances human abilities for specific purposes (e.g., microscope, telescope, micrometer, hydraulics, barometer).			▫ ■				

Biological Sciences: Diversity of Life

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.B.1.1.1	Describe basic external structures of animals and plants.	●						
S K-2.B.1.1.2	Identify a plant or animal based on a given life cycle stage (e.g., butterfly, frog, seed-producing plant).	●						
S K-2.B.2.1.1	Identify and describe habitats (e.g., wetland, meadow, forest, lake, river, ocean, pond).	●						
S3.B.1.1.1	Identify and describe the functions of basic structures of animals and plants (e.g., animals [skeleton, heart, lungs] and plants [roots, stem, leaves]).		■					
S3.B.1.1.2	Classify living things based on their similarities and differences		■					
S3.B.1.1.4	Describe how plants and animals go through life cycles.		■					
S3.B.2.1.1	Identify adaptations of plants and animals that have helped them to survive.		■					
S3.B.2.1.2	Identify and describe plant and animal characteristics that are necessary for survival.		■					
S3.B.2.1.3	Identify characteristics for plant and animal survival in different environments (e.g., desert forest, ocean).		■					
S3.B.2.2.1	Identify physical characteristics (e.g., height, hair color, eye color) that could be passed on to offspring.		■					
S3.B.2.2.2	Identify similar physical characteristics in parents and their offspring.		■					
S4.B.1.1.1	Identify life processes of living things (e.g., growth, digestion, respiration).		●					
S4.B.1.1.2	Compare similar functions of external characteristics of organisms (e.g., anatomical characteristics: appendages, type of covering, body segments).		▫ ●					
S4.B.1.1.4	Describe how different parts of a living thing work together to provide what the organism needs (e.g., parts of plants: roots, stems, leaves).		▫ ●					
S4.B.1.1.5	Describe the life cycles of different organisms (e.g., moth, grasshopper, frog, seed producing plant).		▫ ■					
S4.B.2.1.1	Identify characteristics for plant and animal survival in different environments (e.g., wetland, tundra, desert, prairie, deep ocean, forest).		●					
S4.B.2.1.2	Explain how specific adaptations can help a living organism survive (e.g., protective coloration, mimicry, leaf sizes and shapes, ability to catch or retain water).		▫ ●					
S4.B.2.2.1	Identify physical characteristics (e.g., height, hair color, eye color, attached earlobes, ability to roll tongue) that appear in both parents and could be passed on to offspring.		▫ ■					
S5.B.1.1.1	Recognize that all organisms are composed of cells.		■					
S5.B.1.1.2	Explain the concept of the cell as the basic structural unit of all living things.		▫ ■					
S5.B.1.1.3	Compare the structure and function of basic cell parts in organisms (i.e., plants, animals).		▫ ■					
S5.B.2.1.1	Differentiate between inherited and acquired traits (e.g., scars, injuries).		▫ ●					
S5.B.2.1.2	Explain how inherited traits help organisms survive and reproduce in different environments.		▫ ●					
S5.B.2.1.3	Explain how certain behaviors help organisms survive and reproduce in different environments.		▫ ●					
S6.B.1.1.1	Describe how cells carry out the many functions needed to sustain life.		▫	●				
S6.B.1.1.2	Identify examples of unicellular and multi-cellular organisms (i.e., plants, fungi, bacteria, protista, animals).		▫	●				
S6.B.1.1.3	Explain how many organisms are unicellular and must carry out all life functions in one cell.		▫	●				
S6.B.2.1.1	Distinguish between instinctive and learned animal behaviors that relate to survival.		▫	■				
S7.B.1.1.1	Describe levels of biological organization from cell to organism.		▫	▫ ●				
S7.B.1.1.2	Describe how specific structures in living things (from cell to organism) help them function effectively in specific ways (e.g., chlorophyll in plant cells: photosynthesis, root hairs: increased surface area, beak structures in birds: food gathering, cacti spines: protection from predators).		▫	▫ ●				
S7.B.1.1.3	Explain how characteristic similarities and differences (from cell to organism) are used to identify and/or categorize organisms.		▫	▫ ●				
S7.B.1.2.1	Explain how cells arise from the division of a pre-existing cell.			▫ ●				
S7.B.1.2.2	Compare various basic sexual and asexual reproductive processes (e.g., budding, cuttings).			▫ ●				
S7.B.1.2.3	Explain why the life cycles of different organisms have varied lengths.			▫ ●				
S7.B.2.1.1	Explain how inherited traits (genes) and/or behaviors help organisms survive and reproduce in different environments.		▫	▫ ●				
S7.B.2.1.2	Describe how natural selection is an underlying factor in a population's ability to adapt to change.			▫ ■				
S7.B.2.1.3	Explain that adaptations within species (physical, behavioral, physiological) are developed over long periods of time.			▫ ■				
S7.B.2.2.1	Identify and explain differences between inherited and acquired traits.			▫ ■				
S7.B.2.2.2	Recognize evidence that the gene is the basic unit of inheritance and explain the effect of dominant and recessive genes on inherited traits.		▫	▫ ■				
S7.B.2.2.3	Explain how mutations can alter a gene and are a source of new variations in a population.		▫	▫ ■				
S7.B.2.2.4	Describe how selective breeding or biotechnologies can change the genetic makeup of an organism (e.g., domesticated dogs, horses, cows; crops, hybrid plants; integrated pest management)			▫ ■				
S8.B.1.1.1	Describe the structures of living things that help them function affectively in specific ways (e.g., adaptations and characteristics).			▫ ●				
S8.B.1.1.2	Compare similarities or differences in both internal structures (e.g., invertebrate/vertebrate, vascular/nonvascular, single-celled/multi-celled, and external structures (e.g., appendages, body segments, type of covering, size, shape) of organisms.			▫ ■				
S8.B.1.1.3	Apply knowledge of characteristic structures to identify or categorize organisms (i.e., plants, animals, fungi, bacteria, and protista).			▫ ■				
S8.B.1.1.4	Identify the levels of organization from cell to organism and describe how specific structures (parts), which underlie larger systems, enable the system to function as a whole.			▫ ■				
S8.B.2.1.1	Explain how inherited structures or behaviors help organisms survive and reproduce in different environments.			▫ ●				
S8.B.2.1.2	Explain how different adaptations in individuals of the same species may affect survivability or reproduction success.			▫ ■				
S8.B.2.1.3	Explain that mutations can alter a gene and are the original source of new variations.			▫ ●				
S8.B.2.1.4	Describe how selective breeding or biotechnology can change the genetic makeup of organisms.			▫ ●				
S8.B.2.1.5	Explain that adaptations are developed over long periods of time and are passed from one generation to another.			▫ ●				
S8.B.2.2.1	Identify and explain differences between inherited and acquired traits.			▫ ●				
S8.B.2.2.2	Recognize that the gene is the basic unit of inheritance, that there are dominant and recessive genes, that traits are inherited.			●				
BIO.A.1.1.1	Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.			▫	●			
BIO.A.1.2.1	Compare and contrast cellular structures and their functions in prokaryotic and eukaryotic cells.			▫	■			
BIO.A.1.2.2	Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).			▫	■			
BIO.A.2.1.1	Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).			▫	●			
BIO.A.2.2.1	Explain how carbon is uniquely suited to form biological macromolecules.			▫	■			
BIO.A.2.2.2	Describe how biological macromolecules form from monomers.				■			
BIO.A.2.2.3	Compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.				■			
BIO.A.2.3.1	Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.			▫	●			
BIO.A.2.3.2	Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.				■			
BIO.A.3.1.1	Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.				●			
BIO.A.3.2.1	Compare and contrast the basic transformation of energy during photosynthesis and cellular respiration.			▫	■			
BIO.A.3.2.2	Describe the role of ATP in biochemical reactions.				■			
BIO.A.4.1.1	Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.				■			
BIO.A.4.1.2	Compare and contrast the mechanisms that transport materials across the plasma membrane (i.e., passive transport – diffusion, osmosis, facilitated diffusion; active transport – pumps, endocytosis, exocytosis).			▫	■			
BIO.A.4.1.3	Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.				■			
BIO.A.4.2.1	Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).			▫	■			
BIO.B.1.1.1	Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis.					●		
BIO.B.1.1.2	Compare and contrast the processes and outcomes of mitotic and meiotic nuclear divisions.					●		
BIO.B.1.2.1	Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.					●		
BIO.B.1.2.2	Explain the functional relationships among DNA, genes, alleles, and chromosomes and their roles in inheritance.			▫		●		
BIO.B.2.1.1	Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles).					●		
BIO.B.2.1.2	Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).					●		
BIO.B.2.2.1	Describe how the processes of transcription and translation are similar in all organisms.					●		
BIO.B.2.2.2	Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.			▫		■		
BIO.B.2.3.1	Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame-shift).			▫		●		
BIO.B.2.4.1	Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).			▫		■		
BIO.B.3.1.1	Explain how natural selection can impact allele frequencies of a population.			▫		●		
BIO.B.3.1.2	Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration).					●		
BIO.B.3.1.3	Explain how genetic mutations may result in genotypic and phenotypic variations within a population.			▫		●		
BIO.B.3.2.1	Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).			▫		■		
BIO.B.3.3.1	Distinguish among the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.			▫		■		

Life Sciences: Interdependence of Life

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.B.3.1.1	Distinguish between living and nonliving things.	●						
S K-2.B.3.1.2	Identify plants and animals as living things.	●						
S K-2.B.3.2.1	Identify natural events (e.g., fire, flood, extreme weather) and human actions (e.g., road construction, pollution, urban development, dam building) that can impact an ecosystem.	●						
S K-2.B.3.3.1	Identify methods of recycling and reusing resources.	●						
S3.B.1.1.3	Describe the basic needs of plants and animals and their dependence on light, food, air, water, and shelter.		●					
S3.B.3.1.1	Identify the living and nonliving components of an ecosystem (e.g., living [plants, animals] and nonliving [water, soil, air]).		■					
S3.B.3.1.2	Describe the interaction between living and nonliving components of an ecosystem (e.g., plants: [water, sunlight] and animals [air, shelter]).		●					
S3.B.3.2.1	Describe what happens to an animal when its habitat is changed.		■					
S3.B.3.2.2	Describe how changes in the environment (e.g., fire, flood) can affect an ecosystem.		■					
S3.B.3.2.3	Describe how human interactions with the environment impact an ecosystem (e.g., road construction, pollution, urban development, dam building).		■					
S4.B.1.1.3	Describe basic needs of plants and animals (e.g., air, water, food).		▫ ●					
S4.B.3.1.1	Describe the living and nonliving components of a local ecosystem (e.g., lentic and lotic systems, forest, cornfield, grasslands, city park or playground).		▫ ●					
S4.B.3.3.5	Describe interactions between living and nonliving components (e.g. plants – water, soil, sunlight, carbon dioxide, temperature; animals – food, water, shelter, oxygen, temperature) of a local ecosystem.		▫ ■					
S4.B.3.2.1	Describe what happens to a living thing when its habitat is changed.		▫ ■					
S4.B.3.2.2	Describe and predict how changes in the environment (e.g., fire, pollution, flood, building dams) can affect systems.		▫ ■					
S4.B.3.2.3	Explain and predict how changes in seasons affect plants, animals, or daily human life (e.g., food availability, shelter, mobility).		▫ ■					
S4.B.3.3.1	Identify everyday human activities (e.g., driving, washing, eating, industry, farming, littering) within a community that depend on the natural environment.		▫ ●					
S4.B.3.3.2	Describe the human dependence on the food and fiber systems from production to consumption (e.g., food, clothing, shelter, products).		●					
S4.B.3.3.3	Identify biological pests (e.g., plants – foxtail, mold, purple loosestrife, Eurasian water milfoil; animals – aphides, ticks, zebra mussels, starlings, mice) that compete with humans for resources.		■					
S4.B.3.3.4	Describe the effects of pollution (e.g., litter) in the community.		▫ ■					
S4.B.3.1.2	Identify major land uses in the urban, suburban and rural communities (e.g., housing, commercial, recreation).		▫ ■					
S5.B.2.1.4	Identify changes in environmental conditions that can affect the survival of populations and entire species.		▫ ■					
S5.B.3.1.1	Describe the roles of producers, consumers, and decomposers within a local ecosystem.		▫ ■					
S5.B.3.1.2	Describe the relationships between organisms in different food webs.		▫ ●					
S5.B.3.2.1	Identify fossil fuels and alternative fuels used by humans.		▫ ■					
S5.B.3.2.3	Explain how different items are recycled and reused.		▫ ■					
S5.B.3.2.2	Describe the usefulness of Earth's physical resources as raw materials for the human-made world.		▫ ■					
S6.B.2.1.2	Recognize that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival.		▫	■				
S6.B.3.1.1	Describe the behavioral and physical responses of organisms to environmental changes and how those responses affect survival.		▫	●				
S6.B.3.2.1	Compare the usage of fossil fuels and alternative energy resources (e.g., oil, natural gas, coal, wind, solar, water).		▫	■				
S7.B.3.1.1	Describe relationships (e.g., predator/prey competition, symbiosis) between and among organisms in different ecosystems.		▫	▫ ●				
S7.B.3.1.2	Identify the major biomes (terrestrial and aquatic) and describe their characteristic biotic and abiotic factors.			▫ ●				
S7.B.3.2.1	Identify and describe factors that cause and/or influence changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).			▫ ●				
S7.B.3.2.2	Explain how diversity affects the integrity of natural ecological systems.		▫	▫ ●				
S7.B.3.2.3	Describe how human interactions with the environment impact an ecosystem (e.g., road construction, pollution, urban development, dam building/removal).			▫ ●				
S7.B.3.2.4	Explain how changes in environmental conditions can affect the survival of population and entire species (e.g., climate, hibernation, migration, coloration).			▫ ■				
S7.B.3.3.1	Explain how the use of renewable and/or nonrenewable resources affects the environment.			▫ ■				
S7.B.3.3.2	Explain how renewable and/or nonrenewable resources provide for human needs (i.e., energy, food, water, clothing, and shelter).			▫ ■				
S8.B.3.1.1	Explain the flow of energy through an ecosystem (e.g., food chains, food webs).		▫	▫ ●				
S8.B.3.1.2	Identify major biomes and describe abiotic and biotic components (e.g., abiotic: different soil types, air, water sunlight).			▫ ■				
S8.B.3.1.3	Explain relationships among organisms (e.g., producers/consumers, predator/prey, in an ecosystem).		▫	▫ ●				
S8.B.3.2.1	Use evidence to explain factors that affect changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).			▫ ●				
S8.B.3.2.2	Use evidence to explain how diversity affects the ecological integrity of natural systems.			▫ ■				
S8.B.3.2.3	Describe the response of organisms to environmental changes (e.g., changes in climate, hibernation, migration, coloration) and how those changes affect survival.			▫ ●				
S8.B.3.3.1	Explain the long-term effects of using integrated pest management (e.g., herbicides, natural predators, biogenetics) on the environment.			▫ ■				
S8.B.3.3.2	Explain how renewable and nonrenewable resources provide for human needs (i.e., energy, food, water, clothing, and shelter).			▫ ■				
S8.B.3.3.3	Describe how waste management affects the environment (e.g., recycling, composting, landfills, incineration, sewage treatment).			▫ ■				
S8.B.3.3.4	Explain how human activities may affect local, regional, and global environments.			▫ ■				
BIO.B.4.1.1	Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, biosphere).			▫		●		
BIO.B.4.1.2	Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.			▫		●		
BIO.B.4.2.1	Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).			▫		●		
BIO.B.4.2.2	Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).			▫		●		
BIO.B.4.2.3	Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, nitrogen cycle).					■		
BIO.B.4.2.4	Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).			▫		■		
BIO.B.4.2.5	Describe the effects of limiting factors on population dynamics and potential species extinction.			▫		●		

Physical Sciences: Matter

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.C.1.2.1	Describe basic changes to properties of matter (e.g., formation of mixtures and solutions, baking and cooking, freezing, heating, evaporating, melting).	●						
S3.C.1.1.1	Describe matter in terms of its observable properties (e.g., weight, mass, shape, size, color, texture, and state).		●					
S3.C.1.1.2	Classify matter using observable physical properties. (e.g., weight, mass, shape, size, color, texture, and state).		●					
S3.C.1.1.3	Classify a substance as a solid, a liquid, or a gas.		●					
S3.C.1.1.4	Recognize and identify how water goes through phase changes (i.e., evaporation, condensation, freezing, and melting).		●					
S3.C.1.1.5	Describe how the properties of matter can be changed (e.g., heating, cooling, physical weathering).		■					
S4.C.1.1.1	Use physical properties (e.g., mass, shape, size, volume, color, texture, magnetic property, state (solid, liquid, or gas), conductivity (electrical or heat)) to describe matter.		▫ ■					
S4.C.1.1.2	Categorize/group objects using physical characteristics.		▫ ■					
S5.C.1.1.2	Differentiate between volume and mass.		▫ ●					
S5.C.1.2.1	Describe how water changes from one state to another.		▫ ●					
S5.C.1.2.2	Identify differences between chemical and physical changes of matter.		▫ ●					
S5.C.3.1.1	Differentiate between the mass and weight of an object.		▫ ■					
S6.C.1.1.1	Describe how characteristic physical properties of matter can be used to distinguish one substance from another (e.g., boiling point, freezing/melting points).		▫	●				
S6.C.1.1.2	Explain that materials are characterized by having a specific amount of mass in each unit of volume (density).		▫	●				
S6.C.1.2.1	Describe how water changes from one state to another.		▫	■				
S6.C.1.2.2	Identify differences between chemical and physical changes of matter.		▫	■				
S7.C.1.1.1	Use characteristic physical or chemical properties of matter to distinguish one substance from another (e.g., density, freezing/melting points, solubility, ability to rust).			▫ ■				
S7.C.1.1.2	Recognize that the atom is the basic building block for all matter.			■				
S7.C.1.1.3	Explain the differences between elements, compounds, and mixtures.			■				
S7.C.1.1.4	Describe the relationship between mass and volume as density.		▫	▫ ■				
S7.C.1.2.1	Identify the reactants and products of simple chemical reactions (e.g., photosynthesis, cellular respiration).			▫ ■				
S8.C.1.1.1	Explain the differences among elements, compounds, and mixtures.			■				
S8.C.1.1.2	Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).			▫ ●				
S8.C.1.1.3	Identify and describe reactants and products of simple chemical reactions.			▫ ■				
CHEM.A.1.1.1	Classify physical or chemical changes within a system in terms of matter and/or energy.			▫			●	
CHEM.A.1.1.2	Classify observations as qualitative and/or quantitative.			▫			●	
CHEM.A.1.1.3	Utilize significant figures to communicate the uncertainty in a quantitative observation.						■	
CHEM.A.1.1.4	Relate the physical properties of matter to its atomic or molecular structure.			▫			●	
CHEM.A.1.1.5	Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds containing polyatomic ions).			▫			■	
CHEM.A.1.2.1	Compare and contrast properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating).			▫			●	
CHEM.A.1.2.2	Differentiate between homogeneous and heterogeneous mixtures (e.g., how such mixtures can be separated).			▫			●	
CHEM.A.1.2.3	Describe how factors (e.g., temperature, concentration, surface area) can affect solubility.			▫			●	
CHEM.A.1.2.4	Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).						■	
CHEM.A.1.2.5	Describe how chemical bonding can affect whether a substance dissolves in a given liquid.			▫			■	
CHEM.A.2.1.1	Describe the evolution of atomic theory leading to the current model of the atom based on the works of Dalton, Thomson, Rutherford, and Bohr.						●	
CHEM.A.2.1.2	Differentiate between the mass number of an isotope and the average atomic mass of an element.						●	
CHEM.A.2.2.1	Predict the ground state electronic configuration and/or orbital diagram for a given atom or ion.						●	
CHEM.A.2.2.2	Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bond formations, reactivity).						■	
CHEM.A.2.2.3	Explain the relationship between the electron configuration and the atomic structure of a given atom or ion (e.g., energy levels and/or orbitals with electrons, distribution of electrons in orbitals, shapes of orbitals).			▫			■	
CHEM.A.2.2.4	Relate the existence of quantized energy levels to atomic emission spectra.						■	
CHEM.A.2.3.1	Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table.						●	
CHEM.A.2.3.2	Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends.						●	
CHEM.B.1.1.1	Apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, molecules, and/or formula units).							●
CHEM.B.1.2.1	Determine the empirical and molecular formulas of compounds.							■
CHEM.B.1.2.2	Apply the law of definite proportions to the classification of elements and compounds as pure substances.							■
CHEM.B.1.2.3	Relate the percent composition and mass of each element present in a compound.							■
CHEM.B.1.3.1	Explain how atoms combine to form compounds through ionic and covalent bonding.							●
CHEM.B.1.3.2	Classify a bond as being polar covalent, non-polar covalent, or ionic.							●
CHEM.B.1.3.3	Use illustrations to predict the polarity of a molecule.			▫				●
CHEM.B.1.4.1	Recognize and describe different types of models that can be used to illustrate the bonds that hold atoms together in a compound (e.g., computer models, ball and stick models, graphical models, solid-sphere models, structural formulas, skeletal formulas, Lewis dot structures).							●
CHEM.B.1.4.2	Utilize Lewis dot diagrams to predict the structure and bonding in simple compounds.							●
CHEM.B.2.1.1	Describe the roles of limiting and excess reactants in chemical reactions.							●
CHEM.B.2.1.2	Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction.							●
CHEM.B.2.1.3	Classify reactions as synthesis, decomposition, single replacement, double replacement, or combustion.							●
CHEM.B.2.2.2	Predict products of simple chemical reactions (e.g., synthesis, decomposition, single replacement, double replacement, combustion).							■
CHEM.B.2.1.5	Balance chemical equations by applying the Law of Conservation of Matter.							■
CHEM.B.2.2.1	Predict the amounts of reactants and products involved in a chemical reaction using molar volume of a gas at STP.							●
CHEM.B.2.1.4	Utilize mathematical relationships to predict changes in the number of particles, the temperature, the pressure, and the volume in a gaseous system (i.e., Boyle's Law, Charles' Law, the Combined Gas Law, and the Ideal Gas Law, Dalton's Law of Partial Pressure).							■

Physical Sciences: Energy

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S3.C.2.1.1	Identify basic forms and sources of energy (e.g., sun, heat, light, sound).		●					
S3.C.2.1.2	Identify simple transformations of energy (e.g., eating food to get energy, rubbing hands together to create heat).		●					
S3.C.2.1.3	Identify characteristics of sound (i.e., pitch, loudness).		■					
S4.C.2.1.1	Identify energy forms and examples (e.g., light, heat, stored, motion, electrical).		▫ ■					
S4.C.2.1.2	Describe the flow of energy through an object or system (e.g., feeling radiant heat from a light bulb, eating food to get energy, using a battery to light a bulb or run a fan).		▫ ■					
S4.C.2.1.3	Recognize or illustrate simple direct current series and parallel circuits composed of batteries, light bulbs (or other common loads), wire, and on/off- switches.		▫ ■					
S4.C.2.1.4	Identify characteristics of sound (e.g., pitch, loudness, echoes).		■					
S5.C.1.1.1	Identify characteristic properties of matter that are independent of the mass and volume.		▫ ●					
S5.C.2.1.1	Describe how energy exists in many forms (e.g., electrical, mechanical, chemical, heat, light, sound) and can be transformed within a system.		▫ ●					
S5.C.2.1.2	Describe how heat energy is usually a byproduct of an energy transformation.		▫ ●					
S5.C.2.1.3	Distinguish between kinetic and potential energy.		▫ ■					
S5.C.2.1.4	Explain that energy is conserved.		▫ ■					
S6.C.2.1.1	Describe how heat moves in predictable ways from warmer objects to cooler ones, until they reach the same temperature.		▫	■				
S6.C.2.1.2	Describe the effect of heat on particle motion during phase changes.		▫	■				
S6.C.2.1.3	Compare various energy sources (i.e., oil, coal, natural gas, solar, wind, and moving water) and describe how these energy sources are transformed into useful forms of energy.		▫	●				
S7.C.1.2.2	Compare and contrast the behavior of particle motion in solids, liquids, and gasses.			▫ ■				
S7.C.2.1.1	Describe how energy is obtained and used by organisms throughout their lives.		▫	▫ ●				
S7.C.2.1.2	Describe how energy is transferred and conserved through a closed system.			▫ ■				
S7.C.2.1.3	Describe energy transformations within an ecosystem.		▫	▫ ■				
S8.C.2.1.1	Distinguish among forms of energy (e.g., electrical, mechanical, chemical, heat, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy)			▫ ●				
S8.C.2.1.2	Explain how heat is transferred from one place to another through convection, conduction, or radiation.			▫ ■				
S8.C.2.1.3	Describe how one form of energy (e.g., electrical, mechanical, chemical, heat, light, sound, nuclear) can be converted into a different form of energy.			▫ ●				
S8.C.2.2.1	Describe the sun as a major source of energy that impacts on the environment.			■				
S8.C.2.2.2	Compare the time spans of renewability for fossil fuels and alternative fuels.			▫ ●				
S8.C.2.2.3	Describe the waste (quantity, kind, and potential to cause environmental impacts) derived from the use of renewable and nonrenewable energy sources and their potential impact on the environment.			▫ ■				
S8.C.3.1.2	Distinguish between kinetic and potential energy.			▫ ■				

Physical Sciences: Force and Motion

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S3.C.3.1.1	Identify and describe an object's motion (e.g., start/stop, push/pull, up/down, left/right, faster/slower, spinning).		●					
S3.C.3.1.2	Describe an object's position in terms of its relationship to another object or stationary background (e.g., behind, beside, on top of, above, below).		●					
S4.C.3.1.1	Describe the position of an object by locating it relative to another object or the background (e.g., geographic direction, left, up).		■					
S4.C.3.1.2	Compare the relative movement of objects or describe types of motion that are evident (e.g., bouncing ball, moving in a straight line, back and forth, merry-go-round).		▫ ■					
S4.C.3.1.3	Describe changes in motion caused by forces (e.g., magnetic, pushes or pulls, gravity, friction).		▫ ■					
S5.C.3.1.2	Explain how the mass of an object resists change to motion (inertia).		▫ ■					
S5.C.3.2.1	Recognize that moving electric charges produce magnetic forces and moving magnets produce electric forces (Electromagnetism).		▫ ■					
S5.C.3.2.2	Identify the variables within an electric current (i.e., voltage, current, and resistance).		▫ ■					
S6.C.3.1.1	Compare speed and velocity.		▫	■				
S6.C.3.1.2	Explain why gravitational force depends on how much mass the objects have and the distance between them.		▫	■				
S6.C.3.2.1	Describe how moving electric charges produce magnetic forces and moving magnets produce electric forces.		▫	●				
S6.C.3.2.2	Distinguish between gravity and electromagnetism.		▫	●				
S6.C.3.2.3	Describe the relationship among voltage, current, and resistance (Ohm's Law).			■				
S7.C.3.1.1	Describe how unbalanced forces acting on an object change its velocity.		▫	▫ ●				
S7.C.3.1.2	Explain the mechanical advantages of simple machines.		▫	▫ ●				
S7.C.3.1.3	Describe forces acting on an object (e.g., friction, gravity, balanced verses unbalanced).		▫	▫ ■				
S8.C.3.1.3	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced, inertia, momentum).			▫ ■				
S8.C.3.1.1	Explain that the mechanical advantages produced by simple machines helps to do work (physics) by either overcoming a force or changing the direction of the applied force.			▫ ●				

Earth & Space Sciences: Earth

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.D.1.1.1	Identify different types of Earth materials (e.g., rock, soil, sand, pebbles).	●						
S K-2.D.1.2.1	Identify Earth's natural resources.	●						
S K-2.D.1.3.1	Identify features on Earth's surface (e.g., lakes, rivers, oceans, mountains, plains, volcanoes).	●						
S K-2.D.1.3.2	Describe natural events that alter Earth's surface (e.g., volcanic eruptions, floods, hurricanes, earthquakes).	■						
S K-2.D.2.1.1	Identify weather variables (i.e., temperature, wind speed, wind direction, and precipitation).	●						
S K-2.D.2.1.2	Identify how weather conditions affect daily life.	●						
S3.D.1.1.1	Recognize that rock is composed of different kinds of minerals.		■					
S3.D.1.1.2	Describe the composition of soil as weathered rock and decomposed organic material.		●					
S3.D.1.2.1	Describe why certain resources are renewable and other resources are nonrenewable.		■					
S3.D.1.2.2	Identify and describe examples of renewable and nonrenewable resources.		●					
S3.D.1.2.3	Describe the ways living things benefit from the uses of water resources.		■					
S3.D.1.3.1	Identify ways that cause Earth's surface to be constantly changing (e.g., wind and water erosion, contraction and expansion of surfaces).		■					
S3.D.1.3.2	Distinguish between ways that tear down the surface of Earth and those that build up the surface (e.g., erosion, weathering).		■					
S3.D.1.3.3	Distinguish between slow and rapid changes to Earth's surface (e.g., tides, floods, tidal waves).		■					
S3.D.2.1.1	Recognize that clouds have different characteristics that relate to different weather conditions.		■					
S3.D.2.1.2	Describe how weather variables (i.e., temperature, wind speed, wind direction, and precipitation) are observed and measured.		■					
S3.D.2.1.3	Identify appropriate instruments to study and measure weather elements (i.e. temperature (thermometer), wind direction (wind vane), wind speed (anemometer), precipitation (rain gauge).		■					
S3.D.3.1.1	Describe how Earth rotates on its axis once every 24 hours giving rise to the cycle of night and day.		●					
S4.D.1.1.1	Describe how prominent Earth features in Pennsylvania (e.g., mountains, valleys, beaches, caves, sinkholes, lakes, rivers) were formed.		▫ ■					
S4.D.1.1.2	Identify various Earth structures (e.g., mountain, watershed, peninsula, lake, river, valley) through the use of models.		▫ ■					
S4.D.1.1.3	Describe the composition of soil as weathered rock and decomposed organic remains.		▫ ■					
S4.D.1.2.1	Identify products and by-products of plants and animals for human use (e.g., food, clothing, building materials, paper products).		▫ ■					
S4.D.1.2.2	Identify the types and uses of Earth materials for renewable, nonrenewable, and reusable products (e.g., human-made products: concrete, paper, plastics, metal, fabrics, buildings, highways).		▫ ■					
S4.D.1.2.3	Recognize ways that humans benefit from the use of water resources (e.g., agriculture, energy, recreation).		▫ ■					
S4.D.1.3.1	Describe types of freshwater and saltwater bodies (e.g., lakes, rivers, wetlands, oceans).		■					
S4.D.1.3.2	Explain how water goes through phase changes (i.e., evaporation, condensation, freezing, and melting).		▫ ■					
S4.D.1.3.3	Describe or compare lotic systems (ponds, lakes, bays) and lentic systems (streams, creeks, rivers).		▫ ■					
S4.D.1.3.4	Explain the role and relationship of a watershed or a wetland on water sources (e.g., water storage, groundwater recharge, water filtration, water source, water cycle).		▫ ■					
S4.D.2.1.1	Identify basic clouds types (cirrus, cumulus, stratus, cumulonimbus) and make connections to basic elements of weather (e.g., changes in temperature and precipitation).		▫ ●					
S4.D.2.1.2	Identify weather patterns from data charts or graphs of the data (e.g., temperature, wind direction, wind speed, cloud types, precipitation).		▫ ●					
S4.D.2.1.3	Identify appropriate instruments (thermometer, rain gauge, weather vain, anemometer, barometer to study weather and what they measure.		▫ ●					
S4.D.3.1.3	Describe the causes of seasonal change as it relates to the rotation of the Earth and the tilt of the Earth's axis.		▫ ■					
S5.D.1.1.1	Differentiate between abrupt changes in Earth's surface (e.g., earthquakes, volcanoes, meteor impacts, landslides) and gradual changes in Earth's surface (e.g., lifting up of mountains, wearing away by erosion).		▫ ■					
S5.D.1.1.2	Explain how geological processes observed today (e.g., erosion, changes in the composition of the atmosphere, volcanic eruptions, earthquakes) are similar to those in the past.		▫ ■					
S5.D.1.2.1	Identify physical, chemical, and biological factors that affect water quality.		▫ ■					
S5.D.1.2.2	Describe the importance of wetlands in an ecosystem.		▫ ■					
S5.D.2.1.1	Explain how the cycling of water into and out of the atmosphere impacts climatic patterns.		▫ ■					
S5.D.2.1.2	Explain the effects of oceans and lakes on climate.		▫ ■					
S6.D.1.1.1	Describe how soil fertility, composition, resistance to erosion, and texture are affected by many factors.			■				
S6.D.1.1.2	Identify the three basic rock types and describe their formation (i.e., igneous: granite, basalt, obsidian, and pumice; sedimentary: limestone, sandstone, shale, and coal; metamorphic: slate, quartzite, marble, and gneiss).		▫	■				
S6.D.2.1.1	Describe cloud types and measurable factors (i.e., wind direction, temperature, barometric pressure, moisture, and precipitation) that are associated with various weather patterns.			■				
S6.D.2.1.2	Interpret weather data to develop a weather forecast.		▫	■				
S6.D.2.1.3	Explain how global patterns (jet stream water currents) influence weather in measurable terms (e.g., wind direction, temperature, barometric pressure, precipitation).		▫	■				
S7.D.1.1.1	Identify and describe soil characteristics (e.g., particle size, porosity, and permeability) of different biomes.			▫ ■				
S7.D.1.1.2	Explain how fossils are formed and how they can provide evidence about plants and animals that once lived on Earth.			▫ ■				
S7.D.1.2.1	Compare and contrast the different water systems on Earth (e.g., wetland, watershed, ocean, river).			▫ ■				
S7.D.1.2.2	Compare and contrast biotic and abiotic features of freshwater and saltwater systems.			▫ ■				
S7.D.1.2.3	Describe the importance of water systems on the diversity and distribution of life on Earth.			▫ ■				
S7.D.2.1.1	Explain the effect of wind patterns, circulation of oceans currents, atmospheric pressure and temperature on weather.		▫	▫ ■				
S7.D.2.1.2	Describe changes in atmospheric conditions associated with various weather patterns.			▫ ■				
S8.D.1.1.1	Explain the rock cycle as changes in the solid earth and rock types found in Pennsylvania (igneous – granite, basalt, obsidian, pumice, ; sedimentary – limestone, sandstone, shale, coal; and metamorphic – slate, quartzite, marble, gneiss).			▫ ●				
S8.D.1.1.2	Compare and contrast (geological processes, length of time over which change occurs, factors affecting the rate of change) different types of changes in Earth's surface (e.g., landslides, volcanic eruptions, earthquakes, mountain building, new land being formed, weathering, erosion, sedimentation, soil formation).			▫ ●				
S8.D.1.1.3	Identify soil types. (i.e., humus, topsoil, subsoil, loam, loess, and parent material) and their characteristics (particle size, porosity, permeability) found in different biomes and in Pennsylvania, and explain how they formed.			▫ ■				
S8.D.1.1.4	Explain how fossils provide evidence about plants and animals that lived long ago throughout Pennsylvania's history (e.g., fossils provide evidence of different environments).			▫ ■				
S8.D.1.2.1	Describe a product's (synthetic gas produced from coal, bio-diesel produced from soybeans, ethanol produced from corn, laminated hardwood flooring produced from maple trees) transformation process from production to consumption (e.g., prospecting, propagating, growing, maintaining, adapting, treating, converting, distributing, disposing) and explain the process's potential impacts on Earth's resources.			▫ ■				
S8.D.1.2.2	Describe potential impacts of human-made processes (e.g., manufacturing, agriculture, transportation, mining on Earth's resources, both nonliving (air, water, or earth materials) and living (plants and animals).			▫ ■				
S8.D.1.3.1	Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).			▫ ●				
S8.D.1.3.2	Compare and contrast characteristics of freshwater and saltwater systems on the basis of their physical characteristics (composition, density, electrical conductivity) and their use as natural resources.			▫ ●				
S8.D.1.3.3	Distinguish among different water systems (e.g., wetland systems, ocean systems, river systems, watersheds) and describe their relationships to each other as well as to landforms.			▫ ●				
S8.D.1.3.4	Identify the physical characteristics of a stream and how these characteristics determine the types of organisms found in an aquatic environment (e.g., biological diversity, water quality, flow rate, tributaries, surrounding watershed).			▫ ■				
S8.D.2.1.1	Explain the impact of water systems on the local weather or the climate of a region (e.g., lake effect snow, land/ocean breezes).			▫ ■				
S8.D.2.1.2	Identify how global patterns of atmospheric movement influence regional weather and climate.			▫ ■				
S8.D.2.1.3	Identify how cloud types, wind directions and barometric pressure changes are associated with weather patterns in different regions of the country.			▫ ■				

Earth & Space Sciences: The Universe

Content Code	Eligible Content	Grades K–2*	Grades 3–5*	Grades 6–8*	Biology Module 1 Cells and Processes	Biology Module 2 Continuity and Unity of Life	Chemistry Module 1 Structure and Properties of Matter	Chemistry Module 2 The Mole Concept and Chemical Interactions
S K-2.D.3.1.1	Identify objects that can be observed in the day or night sky (i.e., the Moon, planets, the Sun and other stars).	■						
S K-2.D.3.1.2	Describe and identify the four seasons in Pennsylvania.	●						
S3.D.3.1.2	Describe the predictable patterns of change that occur over time in the observable shape of the moon.		●					
S4.D.3.1.2	Explain how the motion of the sun, earth, moon system relates to time (e.g., days, months, years).		▫ ■					
S4.D.3.1.1	Describe motions of the sun-Earth-moon system.		▫ ●					
S5.D.3.1.1	Describe the patterns of Earth's rotation and revolution in relation to the sun and moon (i.e., solar eclipse, phases of the moon, time).		■					
S5.D.3.1.2	Compare the general characteristics of the inner planets of our solar system (i.e., size, orbital path, surface characteristics, and moons).		▫ ●					
S6.D.3.1.1	Compare the size and surface features of the planets that comprise the solar system as well as the objects orbiting them.		▫	■				
S6.D.3.1.2	Describe how the size, composition, and surface features of the planets are influenced by their distance from the sun.			■				
S7.D.3.1.1	Describe the patterns of Earth's rotation and revolution in relation to the sun and moon (i.e., solar eclipse, lunar eclipse, phases of the moon, time).			▫ ●				
S7.D.3.1.2	Explain how gravity is the essential force in determining the motions of the planets and other objects in the solar system.			▫ ■				
S7.D.3.1.3	Compare the properties and conditions of objects in the solar system to those of Earth.			■				
S7.D.3.1.4	Identify and describe instruments that are used to study the universe (e.g., telescope, probes, satellites, space observatories).			■				
S8.D.3.1.1	Describe patterns of Earth's movements (i.e., rotation, revolution) in relation to the moon and sun (i.e., phases, eclipses, and tides).			▫ ●				
S8.D.3.1.3	Compare and contrast characteristics of celestial bodies found in the solar system (e.g., planets, moons, asteroids, comets, meteors, meteoroids, meteorites, inner and outer planets).			▫ ●				
S8.D.3.1.2	Describe the role of gravity as the force that governs the movement of the solar system and universe.			▫ ●				

■ When students are expected to demonstrate the knowledge, skills, and abilities described by an eligible content—**No VMC is currently available**.

● When students are expected to demonstrate the knowledge, skills, and abilities described by an eligible content—**VMC is currently available**.

▫ When grade appropriate instruction pertaining to an eligible content should begin.

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