SOUTHERN LEHIGH SCHOOL DISTRICT
5775 Main Street
Center Valley, PA 18034

Scope and Sequence for **Grade 4 Science**

Pennsylvania Long-Term Transfer Goals for Science

1. Approach science as a reliable and tentative way of knowing and explaining the natural world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

Big Idea: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Essential Question: How is energy transferred and conserved?

NGSS Performance Expectations	PA Academic Standards for Science*
4-PS3 Energy **PS3.A: Definitions of Energy** **4-PS3-1** Use evidence to construct an explanation relating the speed of an object to the energy of that object. **PS3.A/PS3.B: Definitions of Energy and Conservation of Energy and Energy Transfer** **4-PS3-2** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **PS3.A/PS3.B/PS3.C: Definitions of Energy, Conservation of Energy and Energy Transfer, and Relationship Between Energy and Forces** **4-PS3-3** Ask questions and predict outcomes about the changes in energy that occur when objects collide. ***This section continues on the next page.***	**3.2.B Physics** **2. Energy Storage and Transformations: Conservation Laws** **3.2.2.B2** Explore and describe how different forms of energy cause changes. (e.g., sunlight, heat, wind). **3.2.3.B2** Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound, and heat. **3.2.4.B2** Identify types of energy and their ability to be stored and changed from one form to another. **3.2.5.B2** Examine how energy can be transferred from on form to another. **3. Heat/Heat Transfer** **3.2.3.B3** Explore temperature changes that result from the addition or removal of heat. **3.2.4.B3** Understand that objects that emit light often emit heat. **3.2.5.B3** Demonstrate how heat energy is usually a by product of energy transformation. ***This section continues on the next page.***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued… **PS3.C/PS3.D: Conservation of Energy and Energy Transfer and Energy in Chemical Processes and Everyday Life** **4-PS3-4** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	***Continued…*** **4. Electrical and Magnetic Energy** **3.2.3.B4** (Grade 3) Identify and classify objects and materials that are conductors or insulators of electricity. Identify and classify objects and materials as magnetic or non-magnetic. **3.2.4.B4** (Grade 3) Apply knowledge of basic electrical circuits to the design and construction of simple direct current circuits. Compare and contrast series and parallel circuits. Demonstrate that magnets have poles that repel and attract each other. **3.2.5.B4** Demonstrate how electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced. Demonstrate how electromagnets can be made and used.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**S4.A.1.3.3** (Grades K & 2) Observe and describe the change to objects caused by temperature change or light.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.C Physical Sciences
S4.C.1 Structure, Properties, and Interaction of Matter and Energy	
S4.C.1.1 Describe observable physical properties of matter.	**S4.C.1.1.1** (Grades 2 & 3) Use physical properties [e.g., mass, shape, size, volume, color, texture, magnetism, state (i.e., solid, liquid, and gas), conductivity (i.e., electrical and heat)] to describe matter.
	S4.C.1.1.2 (Grades 2 & 3) Categorize/group objects using physical characteristics.
S4.C.2 Forms, Sources, Conversion, and Transfer of Energy	
S4.C.2.1 Recognize basic energy types and sources, or describe how energy can be changed from one form to another.	**S4.C.2.1.1** (Grades K & 1) Identify energy forms, energy transfer, and energy examples (e.g., light, heat, electrical).
	S4.C.2.1.2 (Grade K) 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.

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Big Idea: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Essential Question: How are waves used to transfer energy and information?

NGSS Performance Expectations	PA Academic Standards for Science*
4-PS4 Waves and their Applications in Technologies for Information Transfer **PS4.A: Wave Properties** **4-PS4-1** Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **PS4.B: Electromagnetic Radiation** **4-PS4-2** Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **PS4.C: Information Technologies and Instrumentation** **4-PS4-3** Generate and compare multiple solutions that use patterns to transfer information.	**3.2.B Physics** **5. Nature of Waves (Sound and Light Energy)** **3.2.1.B5** (Grade 1) Compare and contrast how light travels through different materials. Explore how mirrors and prisms can be used to redirect light beam. **3.2.3.B5** (Grade 1) Recognize that light travels in a straight line until it strikes an object or travels from one material to another. **3.2.4.B5** (Grade 1) Demonstrate how vibrating objects make sound and sound can make things vibrate. Demonstrate how light can be reflected, or absorbed by an object. **3.2.5.B5** (Grade 1) Compare the characteristics of sound as it is transmitted through different materials. Relate the rate of vibration to the pitch of the sound. **6. Unifying Themes** **3.2.3.B6** ENERGY Recognize that light from the sun is an important source of energy for living and nonliving systems and some source of energy is needed for all organisms to stay alive and grow. **3.2.4.B6** ENERGY Give examples of how energy can be transformed from form to another.

Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.C Physical Sciences
S4.C.2 Forms, Sources, Conversion, and Transfer of Energy	
S4.C.2.1 Recognize basic energy types and sources, or describe how energy can be changed from one form to another.	**S4.C.2.1.1** (Grades K & 1) Identify energy forms, energy transfer, and energy examples (e.g., light, heat, electrical).
	S4.C.2.1.4 (Grade 1) Identify characteristics of sound (e.g., pitch, loudness, reflection).

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Big Idea: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.
Essential Question: How do organisms live, grow, respond to their environment, and reproduce?

NGSS Performance Expectations	PA Academic Standards for Science*
4-LS1 From Molecules to Organisms: Structures and Processes **LS1.A: Structure and Function** **4-LS1-1** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **LS1.D: Information Processing** **4-LS1-1** Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. ***This section continues on the next page.***	**3.1.A Organisms and Cells** **1. Common Characteristics of Life** **3.1.1.A1** (Grades 1 & 3) Categorize living and nonliving things by external characteristics. **3.1.3.A1** (Grades 1 & 3) Describe characteristics of living things that help to identify and classify them. **2. Energy Flow** **3.1.4.A2** (Grades K-4) Describe the different resources that plants and animals need to live. **5. Form and Function** **3.1.4.A5** (Grades 1-4) Describe common functions living things share to help them function in a specific environment. **4.2 Watersheds and Wetlands** **B. Wetlands** **4.2.3.B** Identify plants and animals found in a wetland. **C. Aquatic Ecosystem** **4.2.K.C** Identify that there are living and nonliving components in an aquatic habitat. **4.2.2.C** Identify and describe the basic needs of plants and animals in an aquatic ecosystem. **4.2.3.C** Identify plants and animals that live in lakes, ponds, streams, and wetlands. **4.4 Agriculture and Society** **C. Applying Sciences to Agriculture** **4.4.2.C** Examine life cycles of plants and animals in an aquatic habitat. ***This section continues on the next page.***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…***
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**S4.A.1.3.4** (Grades K-3) Explain what happens to a living organism when its food supply, access to water, shelter, or space is changed (e.g., it might die, migrate, change behavior, eat something else).
S4.A.3 Systems, Models, and Patterns	
S4.A.3.1 Identify systems and describe relationships among parts of a familiar system (e.g., digestive system, simple machines, water cycle).	**S4.A.3.1.2** (Grades K, 1 & 3) Explain a relationship between the living and nonliving components in a system (e.g., food web, terrarium).
	S4.A.3.1.3 (Grades 1 & 3) Categorize the parts of an ecosystem as either living or nonliving and describe their roles in the system.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
S4.B.1 Structure and Function of Organisms	
S4.B.1.1 Identify and describe similarities and differences between living things and their life processes.	**S4.B.1.1.1** (Grades 2 & 3) Identify life processes of living things (e.g., growth, digestion, respiration).
	S4.B.1.1.2 (Grades 1-3) Compare similar functions of external characteristics of organisms (e.g., anatomical characteristics: appendages. Type of covering, body segments).
	S4.B.1.1.3 (Grades K-3) Describe basic needs of plants and animals (e.g., air, water, food).
	S4.B.1.1.4 (Grades 1-3) Describe how different parts of living thing work together to provide what the organism needs (e.g., parts of plants: roots, stems, leaves).
	S4.B.1.1.5 (Grades 2 & 3) Describe the life cycles of different organisms (e.g., moth, grasshopper, frog, seed-producing plant.)
S4.B.3 Ecological Behavior and Systems	
S4.B.3.1 Identify and describe living and nonliving things in the environment and their interaction.	**S4.B.3.1.1** (Grade 3) Describe the living and nonliving components of a local ecosystem (e.g., lentic and lotic systems, forest, cornfield, grasslands, city park, playground).
	S4.B.3.1.2 (Grade 3) 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).
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NGSS Performance Expectations	PA Academic Standards for Science*
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
Continued… **S4.B.2 Continuity of Life**	
S4.B.2.1 Identify and explain how adaptations help organisms to survive.	**S4.B.2.1.1** (Grade 2) Identify characteristics for plant and animal survival in different environments (e.g., wetland, tundra, desert, prairie, deep ocean, forest.)

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Big Idea: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.
Essential Question: How and why do organisms interact with their environment and what are the effects of these interactions?

NGSS Performance Expectations	PA Academic Standards for Science*
Intentionally left blank.	**3.1.C Evolution** **2. Adaptation** **3.1.4.C2** (Grades 1-3) Describe plant and animal adaptations that are important to survival. **3.1.5.C2** Give examples of inherited characteristics (e.g. shape of beak, length of neck, location of eyes, shape of teeth) may change over time as adaptations to changes in the environment that enable organisms to survive. **4.1 Ecology** **D. Biodiversity** **4.1.2.D** Identify differences in living things (color, shape, size, etc.) and describe how adaptations are important for survival. **4.1.4.D** Explain specific adaptations can help organisms survive in their environment. **4.5 Humans and the Environment** **C. Pollution** **4.5.K.C** Identify different types of pollution (land, water or air) and their sources **4.5.1.C** Describe how pollution affects the health of a habitat. **4.5.2.C** Identify how people can reduce pollution. **4.5.3.C** Identify different types of pollution and their sources.
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NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…***
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
S4.B.2 Continuity of Life	
S4.B.2.1 Identify and explain how adaptations help organisms to survive.	**S4.B.2.1.2** (Grades 1-3) 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 Identify that characteristics are inherited and, thus, offspring closely resemble their parents.	**S4.B.2.2.1** (Grades 1 & 3) Identify physical characteristics (e.g., height, hair color, eye color, attached earlobes, ability to toll tongue) that appear in both parents and could be passed on to offspring.
S4.B.3 Ecological Behavior and Systems	
S4.B.3.2 Describe, explain, and predict change in natural or human-made systems and the possible effects of those changes on the environment.	**S4.B.3.2.1** (Grade 3) Describe what happens to a living thing when its habitat is changed.
	S4.B.3.2.2 (Grade 3) Describe and predict how changes in the environment (e.g., fire, pollution, flood, building dams) can affect systems.
	S4.B.3.2.3 (Grades K & 3) Explain and predict how changes in seasons affect plants, animals, or daily human life (e.g., food availability, shelter, mobility).

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Big Idea: The universe is composed of a variety of different objects, which are organized into systems, each of which develops according to accepted physical processes and laws.
Essential Questions: What is the universe, and what is Earth's place in it?

NGSS Performance Expectations	PA Academic Standards for Science*
Intentionally left blank.	**3.3.B Origin and Evolution of the Universe** **1. Composition and Structure** **3.3.1.B1** (Grade 1) Explain why shadows fall in different places at different times of the day. **3.3.2.B1** (Grade 1) Observe and record • Location of the Sun and the Moon in the sky over a day. • Changes in the appearance of the moon over a month. Observe, describe, and predict seasonal patterns of sunrise and sunset. **3.3.3.B1** Relate the rotation of the earth and day/night, to the apparent movement of the sun, moon, and stars across the sky. Describe the changes that occur in the observable shape of the moon over the course of a month. **3.3.4.B1** Identify planets in our solar system and their basic characteristics. Describe the earth's place in the solar system that includes the sun (a star), planets, and many moons. Recognize that the universe contains billions of galaxies and that each galaxy contains many billions of stars. **2. Unifying Themes** **3.3.4.B2** SCALES Know the basic characteristics and uses of telescopes. PATTERNS/PHASES Identify major lunar phases. PATTERNS Explain time (days, seasons) using solar system motions.

Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.D Earth and Space Sciences
S4.D.3 Composition and Structure of the Universe	
S4.D.3.1 Describe Earth's relationship to the Sun and the Moon.	**S4.D.3.1.1** (Grade 1) Describe motions of the Sun – Earth – Moon system.
	S4.D.3.1.2 (Grade 1) Explain how the motion of the Sun – Earth – Moon system relates to time (e.g., days, months, years).
	S4.D.3.1.3 (Grade 1) Describe the causes of seasonal changes as they relate to the revolution of Earth and the tilt of Earth's axis.

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Big Idea: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.
Essential Questions: How and why is the Earth constantly changing?

NGSS Performance Expectations	PA Academic Standards for Science*
4-ESS1 Earth's Place in the Universe **ESS1.C: The History of Planet Earth** **4-ESS1-1** Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. **4-ESS2 Earth's Systems** **ESS2.A: Earth Materials and Systems** **4-ESS2-1** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. **ESS2.B: Plate Tectonics and Large-Scale System Interactions** **4-ESS2-2** Analyze and interpret data from maps to describe patterns of Earth's features. ***This section continues on the next page.***	**3.3.A Earth Structure, Processes and Cycles** **1. Earth Features and the Processes that Change It** **3.3.K.A1** (Grade 2) Distinguish between three types of earth materials – rock, soils, and sand. **3.3.1.A1** (Grade 2) Observe, describe and sort earth materials. Compare the composition of different soils. **3.3.3.A1** (Grade 2) Explain and give examples of the ways in which soil is formed. **3.3.4.A1** (Grade 2 & 3) Describe basic landforms. Identify the layers of the earth. Recognize that the surface of earth changes due to slow processes and rapid processes. **3.3.5.A1** (Grade 2 & 3) Describe how landforms are the result of a combination of destructive forces such as erosion and constructive erosion, deposition of sediment, etc. **2. Earth's Resources/Materials** **3.3.3.A2** (Grade 2) Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properties. **3.3.4.A2** (Grade 2 & 3) Identify basic properties and uses of Earth's materials including rocks, soils, water, and gases of the atmosphere. **3. Earth's History** **3.3.5.A3** (Grade 2) Explain how geological processes observed today such as erosion movement of lithospheric plates, and changes in the composition of the atmosphere are similar to those in the past. **4. Water** **3.3.1.A4** Identify and describe types of fresh- and salt-water bodies (ocean, rivers, lakes, ponds). **6. Unifying Themes** **3.3.4.A6** (Grade 3) MODEL/SCALE Identify basic landforms using models and simple maps. CONSTANCY/CHANGE Identify simple changes in the earth system as air, water, soil, and rock interact. SCALE Explain how weather elements are measured. ***This section continues on the next page.***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…*** **3.4.A The Scope of Technology** **1. Characteristics of Technology** **3.4.3.A1** Identify how the natural made world and the human made world are different. **2. Core Concepts of Technology** **3.4.3.A2** Identify that some systems are found in nature while other are made by humans. **4.1 Ecology** **E. Succession** **4.1.3.E** Identify changes in the environment over time. **4.2 Watersheds and Wetlands** **A. Watersheds** **4.2.3.A** Define the term watershed. Identify the watersheds in which you reside. **B. Wetlands** **4.2.K.B** Differentiate between terrestrial, aquatic, and wetland ecosystems in Pennsylvania. **4.3.4.B** Describe the characteristics of different types of wetlands.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.3 Systems, Models, and Patterns	
S4.A.3.1 Identify systems and describe relationships among parts of a familiar system (e.g., digestive system, simple machines, water cycle).	**S4.A.3.1.1** (Grade 3) Categorize systems as either natural or human-made (e.g., ballpoint pens, simple electrical circuits, plant anatomy, water cycle).
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.D Earth and Space Sciences
S4.D.1 Earth Features and Processes that Change Earth and Its Resources	
S4.D.1.1 Describe basic landforms in Pennsylvania.	**S4.D.1.1.1** (Grade 2) Describe how prominent Earth features in Pennsylvania (e.g., mountains valleys, caves, sinkholes, lakes, rivers) were formed.
	S4.D.1.1.2 Identify various Earth structures (e.g., mountains, watersheds, peninsulas, lakes, rivers, valleys) through the use of models.
	S4.D.1.1.3 (Grade 2) Describe the composition of soli as weathered rock and decomposed organic remains.
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NGSS Performance Expectations	PA Academic Standards for Science*
Continued… **S4.D.1.3** Describe Earth's different sources of water or describe changes in the form of water.	***Continued…*** **S4.D.1.3.1** (Grades 2 & 3) Describe types of freshwater and saltwater bodies (e.g., lakes, rivers, wetlands, oceans). **S4.D.1.3.3** (Grade 3) Describe or compare lentic systems (i.e., ponds, lakes, and bays) and lotic systems (i.e., streams, creeks, and rivers).

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Big Idea: The Earth's surface processes affect and are affected by human activities.
Essential Questions: How do Earth's processes and human activities affect each other?

NGSS Performance Expectations	PA Academic Standards for Science*
4-ESS3 Earth and Human Activity **ESS3.A: Natural Resources** **4-ESS3-1** Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. **ESS3.B: Natural Hazards** **4-ESS3-2** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. ***This section continues on the next page.***	**3.3.A Earth Structure, Processes, and Cycles** **2. Earth's Resources/Materials** **3.3.4.A2** Identify basic properties and uses of Earth's materials including rocks, soils, water, and gases of the atmosphere. **3.3.5.A2** Describe the usefulness of Earth's physical resources as raw materials for the human made world. **4.3 Natural Resources** **A. Use of Natural Resources** **4.3.K.A** Identify some renewable resources used in the classroom. **4.3.1.A** Identify some renewable resources used in the community. **4.3.2.A** Describe the jobs/hobbies people have in the community that relate to natural resources. **4.3.3.A** Identify the natural resources used to make various products. **B. Availability of Natural Resources** **4.3.K.B** Recognize the importance of conserving natural resources. **4.3.1.B** Recognize the difference between renewable and nonrenewable resources. **4.3.2.B** Identify products and by-products derived from renewable resources. **4.3.3.B** Identify local natural resources. ***This section continues on the next page.***

NGSS Performance Expectations	PA Academic Standards for Science*
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	4.4 Agriculture and Society
	A. Food and Fiber Systems **4.4.K.A** Identify common plants and animals found in Pennsylvania agricultural systems **4.4.1.A** Describe the role of soil in agricultural systems **4.4.2.A** Identify agriculture as a living system and that food and fiber originate from plants and animals. **4.4.3.A** Identify Pennsylvania crops that provide food for the table and fiber for textiles.
	B. Important of Agriculture **4.4.K.B** Identify common plants and animals used by people. **4.4.1.B** Identify products and by-products of the agricultural system. **4.4.2.B** Explain how agriculture supports jobs in Pennsylvania. **4.4.3.B** Explain how agriculture meets the basic needs of humans. **4.4.4.B** Describe how humans rely on the food and fiber system. Identify Pennsylvania's important agricultural products.
	D. Technology Influences on Agriculture **4.4.K.D** Identify tools and machinery commonly used in agriculture. **4.4.1.D** Identify tools used by native Americans and early settlers in agriculture. **4.4.3.D** Identify technology used in agriculture. **4.4.4.D** Identify how technology affects the development of civilizations through agricultural production
	4.5 Humans and the Environment
	A. Sustainability **4.5.K.A** Identify what people use in their everyday life. **4.5.1.A** Identify resources humans use from the environment. **4.5.2.A** Identify the natural resources used to make various products. **4.5.3.A** Identify resources humans take from the environment for their survival.
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NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…*** **B. Integrated Pest Management** **4.5.K.B** Identify common pests in our homes, gardens and neighborhoods. **4.5.1.B** Describe why people consider some insects, plants, and other living things to be pests, and ways to control their population numbers. **4.5.3.B** Define the term pest and identify various plants and animals that humans may call pests. **D. Waste Management** **4.5.K.D** Identify waste and practice ways to reduce, reuse, and recycle. **4.5.1.D** Identify where waste from the home, school and community goes for disposal. **4.5.2.D** Describe how people can help the environment by reducing, reusing recycling, and composting. **4.5.3.D** Describe how waste is generated. Identify and propose a solution for a waste issue in the school setting (e.g., litter in the hallways).
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**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.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
S4.B.3 Ecological Behavior and Systems	
S4.B.3.3 Identify and describe human reliance on the environment at the individual or the community level.	**S4.B.3.3.1** Identify everyday human activities (e.g., driving, washing, eating, manufacturing, farming) 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).
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NGSS Performance Expectations	PA Academic Standards for Science*
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	S4.B.3.3.3 Identify biological pests (e.g., fungi – molds, plants – foxtail, purple loosestrife, Eurasian water milfoil; animals – aphids, ticks, zebra mussels, starlings, mice) that compete with humans for resources.
	S4.B.3.3.4 Identify major land uses in the urban suburban and rural communities (e.g., housing, commercial, recreation).
	S4.B.3.3.5 Describe the effects of pollution (e.g., litter) in the community.
Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.D Earth and Space Sciences
S4.D.1 Earth Features and Processes that Change Earth and Its Resources	
S4.D.1.2 Identify the types and uses of Earth's resources.	**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 (Grade 2) Identify the types and uses of Earth materials for renewable, nonrenewable, and reusable products (e.g., human-mad products: concrete, paper, plastics, fabrics).

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Pennsylvania Inquiry and Design Practices (Grades 3-5)*

Asking questions and defining problems

- Ask questions about what would happen if a variable is changed.
- Identify scientific (testable) and non-scientific (non-testable) questions.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- Use prior knowledge to describe problems that can be solved.
- Define a simple design problem that can be solved through the development of an object tool, process, or system and include several criteria for success and constraints on materials, time, or cost.

Developing and using models

- Identify limitations of models.
- Develop a simple model based on evidence to represent a proposed object or tool.
- Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- Develop and/or use models to describe and/or predict phenomena.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
- Use a model to test cause and effect relationships or interactions concerning the functioning of a natural designed system.

Planning and carrying out investigations

- Evaluate appropriate methods and/or tools for collecting data.
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to design solutions under a range of conditions.
- Collect data about the performance of a proposed object, tool, process or system under a range of conditions.

Constructing explanations and designing solutions

- Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard.)
- Use evidence (e.g., measurements, observation, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Apply scientific ideas to solve design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

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Pennsylvania Inquiry and Design Practices (Grades 3-5)*

Continued…

Analyzing and interpreting data

- When possible and feasible, digital tools should be used.
- Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
- Use data to evaluate and refine design solutions.

Using mathematics and computational thinking

- Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.
- Organize simple data sets to reveal patterns that suggest relationships.
- Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.
- Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.

Engaging in argument from evidence

- Compare and refine arguments based on an evaluation of the evidence presented.
- Distinguish among facts, reasoned judgment, based on research findings, and speculation in an explanation.
- Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.
- Use data to evaluate claims about cause and effect.
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Obtaining, evaluating, and communicating information

- Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.
- Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.

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Pennsylvania Inquiry and Design Practices (Grades 3-5)*

Continued…

Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.1 Reasoning and Analysis	
S4.A.1.1 Identify and explain the application of scientific, environmental, or technological knowledge to possible solutions to problems.	**S4.A.1.1.1** (Grades K-3) Distinguish between a scientific fact and an opinion, providing clear explanations that connect observations and results (e.g., a scientific fact can be supported by making observations.
	S4.A.1.1.2 (Grade 3) 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 a positive or negative impacts on society or the environment.
S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**S4.A.1.3.1** (Grades K-3) Observe and record change by using time and measurement.
	S4.A.1.3.2 (Grades K-3) Describe relative size, distance, or motion.
S4.A.2 Processes, Procedures, and Tools of Scientific Investigations	
S4.A.2.1 Apply skills necessary to conduct an experiment or design a solution to solve a problem.	**S4.A.2.1.1** (Grades K-3) Generate questions about objects, organisms, or events that can be answered through scientific investigations.
	S4.A.2.1.2 (Grades K-3) Design and describe an investigation (a fair test) to test one variable.
	S4.A.2.1.3 (Grades K-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 (Grades K-3) State a conclusion that is consistent with the information/data.
S4.A.2 Processes, Procedures, and Tools of Scientific Investigations	
S4.A.2.2 Identify appropriate instruments for a specific task and describe the information the instrument can provide. ***This section continues on the next page…***	**S4.A.2.2.1** (Grades K-3) 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). ***This section continues on the next page…***

Pennsylvania Inquiry and Design Practices (Grades 3-5)*

Continued…

Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
S4.A.3 Systems, Models, and Patterns	
S4.A.3.2 Use models to illustrate simple concepts and compare the models to what they represent.	**S4.A.3.2.1** (Grades K-3) Identify what different models represent (e.g., maps show physical features, directions, distances; globes represent Earth; drawings of watershed depict terrain; dioramas show ecosystems; concept maps show relationships of ideas).
	S4.A.3.2.2 (Grades K-3) Use models to make observations to explain how systems work (e.g., water cycle, Sun-Earth-Moon system).
	S4.A.3.2.3 (Grades K-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 Identify and make observations about patterns that regularly occur and reoccur in nature.	**S4.A.3.3.1** (Grades K-3) Identify and describe observable patterns (e.g., growth patterns in plants, weather, water cycle).
	S4.A.3.3.2 (Grades K-3) Predict future conditions/events based on observable patterns (e.g., day/night, seasons, sunrise, lunar phases).

Big Ideas	**Essential Questions**
Big Idea 1: Asking questions and defining problems are essential to developing scientific habits of mind.	What kinds of questions do scientists and engineers ask?
Big Idea 2: Scientists construct mental and conceptual models of phenomena to represent current understandings, aid in developing questions and experiments, and to communicate ideas to others.	How do scientists and engineers develop and use models?
Big Idea 3: Scientists and engineers plan and investigate the world to systematically describe it and to develop and test theories and explanations about how the world works.	What do scientists and engineers do to find out more about our world and how it functions?
Big Idea 4: Data must be presented in a form that can reveal any patterns and relationships and that allows results to be communicated to others.	In what ways are data analyzed, interpreted, and communicated?
Big Idea 5: Mathematics enables numerical representation of variables, symbolic representation of relationships between physical entities, and prediction of outcomes.	How is mathematics utilized in doing science?
Big Idea 6: Scientific theories are developed to provide explanations about the nature of particular phenomena, predict future events, or make inferences about past events.	Why are theories valuable constructs in helping scientists understand and explain our world?
Big Idea 7: Scientists and engineers use reasoning and argumentation to make a justified claim about the world.	How do scientists and engineers communicate to others in order to advance science and engineering?
Big Idea 8: Science and engineering are ways of knowing that are represented and communicated by words, diagrams, charts, graphs, images, symbols, and mathematics.	In what ways do scientists and engineers communicate their knowledge?

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