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

Scope and Sequence for **Grade 1 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: 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*
1-PS4 Waves and their Applications in Technologies for Information Transfer **PS4.A: Wave Properties** **1-PS4-1** Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **PS4.B: Electromagnetic Radiation** **1-PS4-2** Make observations to construct an evidence-based account that objects can be seen only when illuminated. **1-PS4-3** Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. **PS4.C: Information Technologies and Instrumentation** **1-PS4-4** Use tools and materials to design and build a device that uses light or sound to solve the problems of communicating over a distance. ***This section continues on the next page…***	**3.2.B Physics** **5. Nature of Waves (Sound and Light Energy)** **3.2.1.B5** 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** Recognize that light travels in a straight line until it strikes an object or travels from one material to another. **3.2.4.B5** 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** 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** **3.2.1.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. ***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.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** Identify energy forms, energy transfer, and energy examples (e.g., light, heat, electrical).
	S4.C.2.1.4 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*
1-LS1 From Molecules to Organisms: Structures and Processes **LS1.A: Structure and Function** **1-LS1-1** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. ***This section continues on the next page…***	**3.1.A Organisms and Cells** **1. Common Characteristics of Life** **3.1.1.A1** Categorize living and nonliving things by external characteristics. **3.1.3.A1** Describe characteristics of living things that help to identify and classify them. **3.1.4.A1** Classify plants and animals according to the physical characteristics that they share. **2. Energy Flow** **3.1.1.A2** Investigate the dependence of living things on the sun's energy, water, food/nutrients, air, living space, and shelter. **3.1.3.A2** Describe the basic needs of living things and their dependence on light, food, air, water, and shelter. **3.1.4.A2** Describe the different resources that plants and animals need to live. **3.1.5.A2** Describe how life on earth depends on energy from the sun. **5. Form and Function** **3.1.1.A5** Identify and describe plant parts and their function. **3.1.2.A5** Explain how different parts of a plant work together to make the organism function. **3.1.3.A5** Identify the structures in plants that are responsible for food production, support, water transport, reproduction, growth, and protection. **3.1.4.A5** Describe common functions living things share to help them function in a specific environment. ***This section continues on the next page…***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…*** **4.1 Ecology** **A. The Environment** **4.1.K.A** Identify the similarities and differences of living and non-living things within the immediate and surrounding environment. **4.1.1.A** Identify and describe the basic needs of living things in a terrestrial habitat. **C. Energy Flow** **4.1.3.C** Identify sources of energy. **4.1.4.C** Explain how most life on earth gets its energy from the sun.
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** 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** Explain a relationship between the living and nonliving components in a system (e.g., food web, terrarium).
	S4.A.3.1.3 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.1.1.2** Compare similar functions of external characteristics of organisms (e.g., anatomical characteristics: appendages. Type of covering, body segments).
	S4.B.1.1.3 Describe basic needs of plants and animals (e.g., air, water, food).
	S4.B.1.1.4 Describe how different parts of living thing work together to provide what the organism needs (e.g., parts of plants: roots, stems, leaves).

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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*
1-LS1 From Molecules to Organisms: Structures and Processes **LS1.B: Growth and Development of Organisms** **1-LS1-2** Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	**3.1.C Evolution** **1. Natural Selection** **3.1.4.C1** Identify different characteristics of plants and animals that help some populations survive and reproduce in greater numbers. Describe how environmental changes can cause extinction in plants and animals. **2. Adaptation** **3.1.2.C2** Explain that living things can only survive if their needs are being met. **3.1.3.C2** Describe animal characteristics that are necessary for survival. **3.1.4.C2** Describe plant and animal adaptations that are important to survival. **3. Unifying Themes** **3.1.1.C3** CONSTANCY AND CHANGE Describe changes that occur as a result of habitat. **4.1 Ecology** **D. Biodiversity** **4.1.K.D** Observe and describe what happens to living things when needs are met.
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** 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).
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** 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.)

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Big Idea: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to their parents.
Essential Questions: How are the characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characterizes?

NGSS Performance Expectations	PA Academic Standards for Science*
1-LS3 Heredity: Inheritance and Variation of Traits **LS3.A/LS3.B: Inheritance and Variation of Traits** **1-LS3-1** Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.	**3.1.B Genetics** **1. Heredity** **3.1.K.B1**** Observe and describe how young animals resemble their parent and other animals of the same kind. **3.1.1.B1**** Grow plants from seed and describe how they grow and change. Compare to adult plants. **3.1.3.B1** Understand that plant and animals closely resemble their parents. **3.1.4.B1** Describe features that are observable in both parents and their offspring. **5. Unifying Themes** **3.1.3.B5** PATTERNS Identify characteristics that appear in both parents and offspring.

Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.B Biological Sciences
S4.B.2 Continuity of Life	
S4.B.2.2 Identify that characteristics are inherited and, this , offspring closely resemble their parents.	**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.

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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*
1-ESS1 Earth's Place in the Universe **ESS1.A: The Universe and its Stars** **1-ESS1-1** Use observations of the sun, moon, and stars to describe patterns that can be predicted. **ESS1.B: Earth and the Solar System** **1-ESS1-2** Make observations at different times of year to relate the amount of daylight to the time of year.	**3.3.A Earth Structure, Processes and Cycles** **5. Weather and Climate** **3.3.3.A5** Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time. **3.3.B Origin and Evolution of the Universe** **1. Composition and Structure** **3.3.1.B1** Explain why shadows fall in different places at different times of the day. **3.3.2.B1**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.

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** Describe motions of the Sun – Earth – Moon system.
	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.3.1.3 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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Pennsylvania Inquiry and Design Practices (Grades K-2)*

Asking questions and defining problems

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

Developing and using models

- Distinguish between a model and the actual object, process, and/or events that model represents.
- Compare models to identify common features and differences.
- Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).

Planning and carrying out investigations

- With guidance, plan and conduct an investigation in collaboration with peers.
- Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (first hand or from media) and/or measurements to collect data that can be used to make comparisons.
- Make observations (first hand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences.

Constructing explanations and designing solutions

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Generate and/or compare multiple solutions to a problem.

Analyzing and interpreting data

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
- Compare predictions (based on prior experiences) to what occurred (observable events).
- Analyze data from tests of an object or tool to determine if it works as intended.

Using mathematics and computational thinking

- Decide when to use qualitative vs. quantitative data.
- Use counting and numbers to identify and describe patterns in the natural and designed world(s).
- Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.
- Use quantitative data to compare two alternative solutions to a problem.

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Pennsylvania Inquiry and Design Practices (Grades K-2)*

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Engaging in argument from evidence

- Identify arguments that are supported by evidence.
- Distinguish between explanations that account for all gathered evidence and those that do not.
- Analyze why some evidence is relevant to a scientific question and some is not.
- Distinguish between opinions and evidence in one/s own explanations.
- Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.
- Construct an argument with evidence to support a claim.
- Make a claim about the effectiveness of an object, too, or solution that is supported by relevant evidence.

Obtaining, evaluating, and communicating information

- Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).
- Describe how specific images (e.g. a diagram showing how a machine works) support a scientific or engineering idea.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.
- Communicate information or design ideas and/or solutions with others in oral and/or numbers that provide detail about scientific ideas, practices, and/or design ideas.

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** 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.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.	**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.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** 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.

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Pennsylvania Inquiry and Design Practices (Grades K-2)*

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Pennsylvania System of School Assessment (Grade 4 PSSA)*	S4.A The Nature of Science
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.	**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).
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** 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 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 Identify and make observations about patterns that regularly occur and reoccur in nature.	**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, 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?

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Pennsylvania Inquiry and Design Practices (Grades K-2)*	
Continued… **Big Idea 5:** Mathematics enables numerical representation of variables, symbolic representation of relationships between physical entities, and prediction of outcomes.	***Continued…*** 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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