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

Scope and Sequence for **Grade 5 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: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.
Essential Question: How can one explain the structure, properties, and interactions of matter?

NGSS Performance Expectations	PA Academic Standards for Science*
5-PS1 Matter and Its Interactions **PS1.A: Structure and Properties of Matter** **5-PS1-1** Develop a model to describe that matter is made of particles too small to be seen. **5-PS1-3** Make observations and measurements to identify materials based on their properties. **PS1.A/PS1.B: Structure and Properties of Matter and Chemical Reactions** **5-PS1-2** Measure and graph quantities to provide evidence that regardless of the type that occurs when heating, cooling, or mixing substances, the total weight of matter in conserved. **PS1.B: Chemical Reactions** **5-PS1-4** Conduct an investigation to determine whether the mixing of two or more substances results in new substances. ***This section continues on the next page.***	**3.2.A Chemistry** **1. Properties of matter** **3.2.4.A1** Identify and classify objects based on their observable and measurable physical properties. Compare and contrast solids, liquids, and gases based on their properties. **2. Structure of Matter** **3.2.4.A2** Demonstrate that materials are composed of parts that are too small to be seen without magnification. **3. Matter & Energy** **3.2.4.A3** Demonstrate the conservation of mass during physical changes such as melting or freezing. ***This section continues on the next page.***

NGSS Performance Expectations	PA Academic Standards for Science*
Continued…	***Continued…*** **4. Reactions** **3.2.1.A4** Observe and describe what happens when substances are heated and cooled. Distinguish between changes that are reversible (melting, freezing) and not reversible (e.g. baking a cake, burning fuel). **3.2.2.A4** Experiment and explain what happens when two or more substances are combined (e.g. mixing, dissolving, and separated (e.g. filtering, evaporation). **3.2.3.A4** Use basic reactions to demonstrate observable changes in properties of matter (e.g. burning, cooking). **3.2.4.A4** Recognize that combining two or more substances may make new materials with different properties. **5. Unifying Themes** **3.2.3.A5** CONSTANCY AND CHANGE Recognize that everything is made of matter.
Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.C Physical Sciences
S8.C.1 Structure, Properties, and Interaction of Matter and Energy	
S8.C.1.1 Explain concepts about the structure and properties (physical and chemical) of matter.	**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.

* Students are working towards mastery of the listed PA Academic Standards and Grade 8 Science PSSA Eligible Content.

Big Idea: Interactions between any two objects can cause changes in one or both of them.
Essential Question: How can one explain or predict interactions between objects within systems?

NGSS Performance Expectations	PA Academic Standards for Science*
5-PS2 Motion and Stability: Forces and Interactions **PS2.B: Types of Interactions** **5-PS2-1** Support an argument that the gravitational force exerted by Earth on objects is directed down.	**3.2.B Physics** **1. Force & Motion of Particles and Rigid Bodies** **3.2.3.B1** Explain how movement can be described in many ways. **3.2.5.B1** Explain how mass of an object resists change to motion.

Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.C Physical Sciences
S8.C.3 Principles of Motion and Force	
S8.C.3.1 Describe the effects of multiple forces on the movement, speed, or direction of an object.	**S8.C.3.1.1** Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).
	S8.C.3.1.2 Distinguish between kinetic and potential energy.

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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*
5-PS3 Energy **PS3.D: Energy in Chemical Processes and Everyday Life** **5-PS3-1** Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	**3.2.B Physics** Heat/Heating Transfer **3.2.4.B3** **2. Energy Storage and Transformations: Conservation Laws** **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 one form to another. **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 one form to another.

Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.C Physical Sciences
S8.C.2 Forms, Sources, Conversion, and Transfer of Energy	
S8.C.2.1 Describe energy sources, transfer of energy, or conversion of energy.	**S8.C.2.1.1** Distinguish among forms of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy).
	S8.C.2.1.2 Explain how energy 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, light, sound, nuclear) can be converted into a different form of energy.
S8.C.2.2 Compare the environmental impact of different energy sources chosen to support human endeavors.	**S8.C.2.2.1** Describe the Sun as a major source of energy that impacts the environment.
S8.C.3 Principles of Motion and Force	
S8.C.3.1 Describe the effects of multiple forces on the movement, speed, or direction of an object.	**S8.C.3.1.2** Distinguish between kinetic and potential energy.

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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*
5-LS1 From Molecules to Organisms: Structures and Processes **LS1.C: Organization for Matter and Energy Flow in Organisms** **5-LS1-1** Support an argument that plants get the materials they need for growth chiefly from air and water. **5-LS2 Ecosystems: Interactions, Energy, and Dynamics** **LS2.A: Interdependent Relationships in Ecosystems** **5-LS2-1** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	**3.1.A Organisms and Cells** **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. **5. Form and 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. **3.1.5.A5** **4.1 Ecology** **A. The Environment** **4.1.5.A** Describe the roles of producers, consumers, and decomposers within a local ecosystem.

Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.B Biological Sciences
S8.B.1 Structure and Function of Organisms	
S8.B.1.1 Describe and compare structural and functional similarities and differences that characterize diverse living things.	**S8.B.1.1.1** Describe the structures of living things that help them function effectively in specific ways (e.eg, adaptations, characteristics).
	S8.B.1.1.3 Apply knowledge of characteristics 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 Continuity of Life	
S8.B.2.1 Explain the basic concepts of natural selection.	**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.

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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*
5-ESS1 Earth's Place in the Universe **ESS1.A: The Universe and its Stars** **5-ESS1-1** Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distance from Earth. **ESS1.B: Earth and the Solar System** **5-ESS1-2** Represent data in graphical displays to reveal patterns of daily changes in length and direct of shadows, day and night, and the seasonal appearance of some stars in the night sky.	**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. **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. **3.3.5.B1** Provide evidence that the earth revolves around (orbits) the sun in a year's time and that the earth rotates on its axis once approximately every 24 hours. **2. Unifying Themes** **3.3.4.B2** SCALES Know the basic characteristics and use of telescopes. PATTERNS/PHASES Identify major lunar phases. PATTERNS Explain time (days, seasons) using solar system motions.

Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.D Earth and Space Sciences
S8.D.3 Composition and Structure of the Universe	
S8.D.3.1 Explain the relationship between and among the objects of our solar system.	**S8.D.3.1.1** Describe patterns of earth's movements (i.e., rotation and revolution) in relation to the moon and sun (i.e., phases, eclipses, and tides)
	S8.D.3.1.2 Describe the role of gravity as the force that governs the movement of the solar system and universe.
	S8.D.3.1.3 Compare and contrast characteristics of celestial bodies found in the solar system (e.g., moons, asteroids, comets, meteors, inner and outer planets).

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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*
5-ESS2 Earth's Systems **ESS2.A: Earth Materials and Systems** **5-ESS2-1** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **ESS2.C: The Roles of Water in Earth's Surface Processes** **5-ESS2-1** Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. ***This section continues on the next page.***	**3.3.A Earth Structure, Processes and Cycles** **3. Earth's History** **3.3.5.A3** 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). **3.3.2.A4** Explore and describe that water exists in solid (ice) and liquid) form. Explain and illustrate evaporation and condensation. **3.3.3.A4** Connect various forms of precipitation to the weather in a particular place and time. **3.3.4.A4** Recognize that Earth's different water resources, including both fresh and saltwater. Describe phase changes in the forms of water on Earth. **3.3.5.A4** Explain the basic components of the water cycle. **5. Weather and Climate** **3.3.4.A5** Describe basic weather elements. Identify weather patterns over time. **3.3.5.A5** Differentiate between weather and climate. Explain how the cycling of water, both in and out of the atmosphere, has an affect on climate. **6. Unifying Themes** **3.3.4.A6** 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…*** **<u>4.2 Watersheds and Wetlands</u>** **A. Watersheds** **4.2.5.A** Explain the water cycle. **B. Wetlands** **4.2.5.B** Identify important wetlands in the United States **C. Aquatic Ecosystems** **4.2.5.C** Identify physical, chemical, and biological factors that affect water quality.
Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.D Earth and Space Sciences
S8.D.1 Earth Features and Processes that Change Earth and Its Resources	
S8.D.1.3 Describe characteristic features of Earth's water system or their impact on resources.	**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 (i.e., composition, density, and electrical conductivity) and their use as natural resources.
	S8.D.1.3.3 Distinguish among different water systems (e.g., wetland systems, ocean systems, rivier systems, ocean systems, watersheds) and describe their relationship to each other as well as to landforms.
S8.D.2 Weather, Climate, and Atmospheric Processes	
S8.D.2.1 Explain how pressure, temperature, moisture, and wind are used to describe atmospheric conditions that affect regional weather or climate.	**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 influences regional weather and climate.

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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*
5-ESS3 Earth and Human Activity **ESS3.C: Human Impacts on Earth Systems** **5-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	**3.3.A Earth Structure, Processes, and Cycles** **2. Earth's Resources/Materials** **3.3.5.A2** Describe the usefulness of Earth's physical resources as raw materials for the human made world. **4.5 Humans and the Environment** **C. Pollution** **4.5.5.C** Explain the difference between point and non-point source pollution. **D. Waste Management** **4.5.5.D** Explain how different items are recycled and reused.

Pennsylvania System of School Assessment (Grade 8 PSSA)*	S8.B Biological Sciences
S8.B.3 Ecological Behavior and Systems	
S8.B.3.1 Explain how renewable and non-renewable resources provide human needs or how these needs impact 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.)

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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 6-8)

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Pennsylvania System of School Assessment (PSSA)	S8.A Nature of Science
S8.A.2 Processes, Procedures, and Tools of Scientific Investigation	
S8.A.2.1 Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.	**S8.A.2.1.1** Use evidence, observations, or a variety of scales (e.g., 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.2.1.6 Identify a design flaw in a simple technological system and devise possible working solutions.
S8.A.2.2 Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.	**S8.A.2.2.1** Describe the appropriate use of instruments and scales to accurately and safely measure time, mass, distance, volume, or temperature 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.2.2.3 Describe ways technology (e.g., microscope, telescope, micrometer, hydraulic, barometer,) extends and enhances human abilities for specific purposes.
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Pennsylvania Inquiry and Design Practices (Grades 6-8)

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Pennsylvania System of School Assessment (PSSA)	S8.A Nature of Science
S8.A.3 Systems, Models, and Patterns	
S8.A.3.1 Explain the parts of a simple system, their roles, and their relationships to the system as a whole.	**S8.A.3.1.1** Describe a system as a group of related parts with specific roles that work together to achieve an observed result.
S8.A.3.2 Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.	**S8.A.3.2.1** Describe how scientists use models to explore relationships in natural systems (e.g., an ecosystem, river system, 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).

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?

* Students are working towards proficiency in the Pennsylvania Inquiry Design Practices and mastery of the listed PA Academic Standards and Grade 8 Science PSSA Eligible Content.