SUBJECT: Science	GRADE: 8
Unit Title: Astronomy	**Time Frame: 7 weeks**

UNIT OVERVIEW

The Astronomy unit is a survey of the primary forces that govern the universe and how the Earth fits within the structure and function of space as a whole. Topics studied include the age and structure of the universe, physical and chemical structure of celestial bodies (including planets, stars and smaller objects), and an overview of and uses for the electromagnetic spectrum.

LRG SKILLS AND DISPOSITIONS	NGSS/PA STANDARDS/PA STEELS
Collaboration and Teamwork Critical Thinking and Problem Solving	3.3.10.B1, 3.3.12.B1, S11.D.3.1.3, S8.D.3.1.1, S8.D.3.1.2, S8.D.3.1.3, S11.D.3.1.1, S11.D.3.1.2, S11.A.1.1.1, S11.A.1.1.4, S11.A.2.1.2, MS-ESS1-1, MS-ESS1-2, MS-ESS1-3 PA STEELS: 3.3.6-8.A, 3.3.6-8.B, 3.3.6-8.C

COMPETENCIES	LEARNING TARGETS
I can gather information about stars by observing them from Earth. I understand that the movements of the Earth, moon, sun, and planets create predictable patterns that explain observations of the sky. *We can infer information about stars based on observations we make from Earth.* *Observations of the sky can be explained by predictable patterns of the movement of Earth, moon, sun and planets.*	I can develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. I can develop and use a model to describe the role of gravity in the motion within galaxies and the solar system. I can analyze and interpret data to determine scale properties of objects in the solar system. I can compare and contrast characteristics *(size, composition, position, motion, etc.)* of celestial bodies in the solar system.

● I can use models to demonstrate understanding of the gravitational relationship between objects in the universe and how their motion affects the Earth.	I can describe planetary and lunar motion and how this patterned movement causes day and night, seasons, phases of the moon and tides. I can describe the structure, formation and life cycle of stars, including the sun, and their properties. I can explain how technology is used to make advances in our understanding of space.
	VOCABULARY
	astronomy satellite Milky Way galaxy expansion Big Bang composition spectra radiation solar energy reflection illuminate orbital plane solar system universe orbit gravity axis cyclical pattern revolution rotation surface feature orbital radii diameter distance composition

	scale ratio proportion

SUBJECT: Science	GRADE: 8
Unit Title: Ecology	Time Frame: 7 weeks

UNIT OVERVIEW
The Ecology unit is taught through the lens that within ecosystems, all components, both living and nonliving, are connected and interdependent. Ecological interactions and levels of organization are covered as well as the way that energy flows through ecosystems of all types. Cycles of matter are introduced as well as a brief overview of natural selection and adaptations. The environmental impact of humans is a focus throughout the unit.

LRG SKILLS AND DISPOSITIONS	NGSS/PA STANDARDS/PA STEELS
Collaboration and Teamwork Critical Thinking and Problem Solving	S11.A.1.2, S11.A.1.3, S.11.B.1.1, S 11.B.2.1, S11.B.3.1, S11.B.3.2, 4.2.10.D, 4.3.10.A-C, 4.6.10.A, 4.6.10.D, 4.7.10.A-C, 4.8.10.B-D, CC.3.5.6-8.A-I, CC.3.6.6-8.G, MS-LS1-6, MS-LS2-1, MS-LS2-3, MS-ESS3-5, MS-ESS3-4, MS-ESS3-3, MS-LS2-2, MS-LS2-4 PA STEELS: 3.1.6-8.I, 3.1.6-8.J, 3.1.6-8.K, 3.1.6-8.L, 3.1.6-8.U, 3.4.6-8.D, 3.4.6-8.E, 3.4.6-8.F, 3.4.6-8.G, 3.4.6-8.H, 3.4.6-8.I
COMPETENCIES	LEARNING TARGETS

I can explain that ecosystems are intricate systems comprising living (biotic) and non-living (abiotic) parts, which interact with each other.

I can explain how matter cycles and energy flows within ecosystems, driven by interactions among various organisms and between organisms and their physical surroundings.

I can comprehend that when the environment changes and species populations shift, it causes changes in ecosystems.

I can recognize that humans rely on biodiversity, which includes various species and ecosystems, for resources. I understand that human activities can affect the diversity of species.

Ecosystems are complex systems that include both living (biotic) and non-living (abiotic) components that interact with each other.

The cycling of matter and the flow of energy within ecosystems occur through interactions among different organisms and between organisms and the physical environment.

As the environment and populations of species change, there are resulting changes in ecosystems.

Humans depend on biodiversity, the variety of species and ecosystems, for resources. Human actions can impact the diversity of species.

- I can connect all the interdependent components of an ecosystem, evaluate the current status of an ecosystem and predict its long-term success.

I can analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

I can construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

I can develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

I can construct an organism supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

I can evaluate competing design solutions for maintaining biodiversity and ecosystem services.

I can gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems.

I can collect, analyze, and interpret environmental data to describe a local environment.

I can obtain and communicate information on how integrated pest management could improve indoor and outdoor environments.

I can obtain and communicate information to describe how best resource management practices and environmental laws are designed to achieve environmental sustainability.

I can design a solution to an environmental issue in which individuals and societies can engage as stewards of the environment.

I can construct an explanation that describes regional environmental conditions and their implications on environmental justice and social equity.

	I can describe levels of organization *(cell, tissue, organ, organ system, organism, population, community, ecosystem, biome, biosphere)* and how they connect. I can identify biotic and abiotic factors in a variety of ecosystems and biomes. I can differentiate between how populations are studied *(mark and recapture, sampling, direct observation, indirect observation)* and when each technique would be used. I can explain relationships *(producer/consumer/decomposer, predator/prey, symbiotic)* among organisms. I can distinguish between, interpret, and create food chains, food webs, and energy pyramids. I can illustrate how matter *(water, carbon, nitrogen)* cycles. I can describe how ecosystems respond to change *(succession, deforestation, invasive species, biodiversity, limiting factors, carrying capacity, etc.)*.I can think, reason, and explain the way a scientist does.
	VOCABULARY
	ecosystem population living nonliving biotic factors abiotic factors predator symbiotic parasitism commensalism mutualism competition prey

	energy diagram (food web) producer consumer decomposer/recycler conservation of matter resilience environmental disruptions biodiversity design solutions ecosystem services limiting factors habitat carrying capacity

SUBJECT: Science	GRADE: 8
Unit Title: Meteorology	Time Frame: 7 weeks

UNIT OVERVIEW	

The Meteorology unit focuses on a general overview of atmospheric structure/function as well as the primary components of all weather (temperature, moisture, pressure). Weather related natural disasters such as tornadoes, hurricanes, and blizzards are studied as they relate to the main components of weather.

LRG SKILLS AND DISPOSITIONS	NGSS/PA STANDARDS/PA STEELS
Collaboration and Teamwork	3.1.10 B, 3.5.10 C, 3.7.10 A- E, MS-ESS2-5, MS-ESS2-6, MS-ESS3-1, MS-PS3-3, MS-ESS3-5

Critical Thinking and Problem Solving	
	PA STEELS: 3.2.6-8.M, 3.3.6-8.I, 3.3.6-8.J, 3.3.6-8.L, 3.3.6-8.M, 3.3.6-8.O
COMPETENCIES	**LEARNING TARGETS**
I can understand that the total change of energy in any system equals the total energy transferred into or out of the system. I can explain how water's presence and properties affect Earth's ecosystems and surface features. I can understand how weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. I can recognize that natural processes can lead to sudden or gradual changes in Earth's systems, and some of these changes may have negative effects on humans. I can recognize how human actions in agriculture, industry, and daily life affect the land, rivers, ocean, and air. *The total change of energy in any system is always equal to the total energy transferred into or out of the system.* *Water's presence and properties impact Earth's ecosystems and surface features.* *Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things.* *Natural processes can cause sudden or gradual changes to Earth's systems, some of which may adversely affect humans.*	I can apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. I can develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. I can collect data to provide evidence for how the motion and complex interactions of air masses result in changes in weather conditions. I can analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. I can apply scientific principles to design a method for monitoring and minimizing human impact on the environment. I can ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. I can describe and illustrate the composition and major layers of the Earth's atmosphere. I can analyze weather maps and weather data from a variety of sources to predict regional weather and climate patterns. I can distinguish between conduction, convection, and radiation. I can compare and contrast the formation, damage and categorization of severe/extreme weather.

Human activities in agriculture, industry, and everyday life have an impact on the land, rivers, ocean, and air. ● I can use meteorological concepts and models to describe, interpret, analyze, and predict weather locally and globally in the short and long term.	I can explain how natural processes and human beings impact the climate over time.
	VOCABULARY
	high/low pressure temperature pressure humidity precipitation wind air mass thermal energy heat conductivity energy transfer latitude altitude Coriolis Effect radiation input output salinity density climate human activities (e.g fossil fuel combustion, cement production, and agricultural activity) natural processes (e.g solar radiation or volcanic activity) greenhouse gas carbon dioxide

SUBJECT: Science	GRADE: 8
Unit Title: Hydrology	Time Frame: 7 weeks

UNIT OVERVIEW	

The Hydrology unit is taught through the lens of human impact, particularly on the Chesapeake Bay. The structure and composition of water is covered, and is connected to the importance of water for the existence of life on Earth. Primary reservoirs and basins of fresh and salt water are overviewed, as well as the local, regional, and global availability and uses of water.

LRG SKILLS AND DISPOSITIONS	NGSS/PA STANDARDS/PA STEELS
Collaboration and Teamwork Critical Thinking and Problem Solving	3.3.10.A5, 4.2.8.A, 4.2.8.B, 4.2.10.A-C, S8.D.1.3.3, S8.C.1.1.2, S8.A.3.1.1, S8.D.1.3.1, S8.D.1.3.2, S8.D.1.3.3, S8.D.1.3.4, MS-ESS2-4, MS-ESS3-1, MS-ESS3-2 PA STEELS: 3.3.6-8.C, 3.3.6-8.E, 3.3.6-8.H, 3.3.6-8.I, 3.3.6-8.K, 3.3.6-8.M, 3.3.6-8.N, 3.4.6-8.E

COMPETENCIES	LEARNING TARGETS
I can explain how observations of the sky are influenced by predictable weather patterns in the movements of the Earth, moon, sun, and planets.	I can analyze and interpret data to determine scale properties of objects in the solar system.

I can understand that the changes we see on Earth happen because energy moves and matter cycles between interconnected systems, including the geosphere, hydrosphere, atmosphere, and biosphere.	I can construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
I can explain how water affects Earth's ecosystems and surface features because of its presence and properties.	I can develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
I can understand that everything humans use, including materials, energy, and fuels, comes from natural sources. Some of these sources can renew over time, while others cannot.	I can develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
I can explain how human actions in agriculture, industry, and daily life affect the land, rivers, oceans, and air.	I can construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
Observations of the sky can be explained by predictable weather patterns of the movement of Earth, moon, sun, and planets.	I can apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
Changes we observe on Earth are the result of energy flowing and matter cycling between interconnected systems (the geosphere, hydrosphere, atmosphere, and biosphere.)	I can construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems.
Water's presence and properties impact Earth's ecosystems and surface features.	I can collect, analyze, and interpret environmental data to describe a local environment.
All materials, energy, and fuels that humans use are derived from natural sources, some of which are renewable over time and others are not.	I can use the water cycle *(evaporation, condensation, precipitation, transpiration, runoff, infiltration)* to explain how water is recycled on Earth.
Human activities in agriculture, industry, and everyday life have an impact on the land, rivers, oceans, and air. • I can connect water's characteristics and forms to a variety of uses and effects on Earth's surface.	I can compare and contrast different water systems (e.g., wetlands, oceans, rivers, watersheds, lakes, ponds, glaciers, icebergs).
	I can describe how water *(glaciers, icebergs, rivers, streams, mouth/delta)* shapes Earth's surface *(erosion, deposition)*.
	I can describe characteristics *(waves, currents, tides, temperature, salinity, density)* of the ocean.
	I can explain how a wetland impacts water quality and the diversity of life within a watershed.

● I can assess how humans impact fresh and salt water systems.	I can identify ways that humans impact water systems *(eutrophication, runoff, erosion, flooding, watershed management, water quality, groundwater)*. I can critique human use of water *(reasons, conservation, decision making, water quality, groundwater)*.
	VOCABULARY
	weathering erosion deposition sediment geoscience process hydrologic cycle transpiration respiration glaciers aquifers latitude altitude Coriolis Effect thermal energy radiation input output water usage land usage pollution per capita consumption population natural resources

SUBJECT: Science	GRADE: 8
Unit Title: Geology	Time Frame: 7 weeks

UNIT OVERVIEW
The Geology unit is focused on providing students with an introduction to the structure and function of the Earth as well as the geologic processes involved in the creation of geologic structures (mountains, volcanoes, islands, etc.) as well as geologic hazards. The main concepts of the rock cycle are covered as well as the primary rock types and their formation.

LRG SKILLS AND DISPOSITIONS	NGSS/PA STANDARDS/PA STEELS
Collaboration and Teamwork Critical Thinking and Problem Solving	3.5.10.A, CC.3.5.6-8.C, CC.3.5.6-8.I, S8.D.1.1.1, S8.D.1.2.1, S8.D.1.2.2, S8.A.1.3.4, 3.5.10.B, CC.3.6-8.G, CC.3.5.6-8I, 3.7.10.B, 3.3.10.A1, S8.D.1.1.2, S11.D.1.1.2, S11.D.1.1.3, S8.A.1.3.2, S8.A.1.1.1, MS-ESS1-4, MS-ESS2-1, MS-ESS2-2, MS-ESS2-3, MS-ESS3-1, MS-ESS3-2 PA STEELS: 3.3.6-8.D, 3.3.6-8.E, 3.3.6-8.F, 3.3.6-8.G, 3.3.6-8.K, 3.3.6-8.L

COMPETENCIES	LEARNING TARGETS
I can understand Earth's planetary history by examining the features we observe today. I can explain that the changes we see on Earth happen because energy moves and matter cycles between connected systems like the geosphere, hydrosphere, atmosphere, and biosphere. I can understand how plate tectonics explains the movements and features of rocks on Earth's surface, both in the past and present.	I can construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. I can construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. I can develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

We can infer Earth's planetary history by features we observe today. *Changes we observe on Earth are the result of energy flowing and matter cycling between interconnected systems (the geosphere, hydrosphere, atmosphere, and biosphere).* *Plate tectonics explains the past and current movements and features of the rocks at Earth's surface.* ● I can apply the Theory of Plate Tectonics to explain geologic processes.	I can analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions. I can construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. I can analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. I can describe Earth in terms of its layers. I can describe features *(volcanoes, earthquakes, trenches, mountains, rift valleys)* found at plate boundaries. I can explain the processes that take place at plate boundaries and how these processes continue to shape the Earth. I can use observations and data to make inferences about geologic events.
● I can classify rocks based on their composition and the processes that formed them.	I can use properties *(hardness, cleavage, fracture, streak, luster, color)* to identify minerals. I can describe the processes *(melting, compaction, cementation, heat, pressure)* that form rocks. I can describe the properties of rocks *(igneous – granite, basalt, obsidian, pumice; sedimentary – limestone, sandstone, shale, coal; and metamorphic – slate, quartzite, marble, gneiss).*
	VOCABULARY
	weathering erosion deposition

	sediment geoscience processes (eg. earthquakes, volcanoes, meteor impacts) chemical/ physical changes melting crystallization deformation sedimentation fossils ridge trench Pangea seafloor spreading natural hazards geologic processes (e.g volcanic activity, sedimentary processes)