

**Pennsylvania High School Science
Academic Standards for Science and Technology and Engineering Education 2009**

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Earth Science	Boardworks High School Earth Presentations
3.3.A. Earth Structure, Processes and Cycles	
1 Earth Features and the Processes that Change It	
3.3.10.A. Grade 10	
Relate plate tectonics to both slow and rapid changes in the earth's surface.	Plate Tectonics Earthquake Causes Earthquake Effects
Describe the rock cycle and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks.	Erosion, Transportation and Deposition The Rock Cycle Volcanoes
Relate geochemical cycles to the conservation of matter.	The Carbon Cycle The Nitrogen Cycle The Water Cycle
Explain how the Earth is composed of a number of dynamic, interacting systems exchanging energy or matter.	The Carbon Cycle The Nitrogen Cycle Recycling Nutrients The Water Cycle
3.3.12.A. Grade 12	
<i>Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part.</i>	–
Analyze the processes that cause the movement of material in the Earth's systems.	The Carbon Cycle The Nitrogen Cycle Recycling Nutrients The Water Cycle
Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy.	Heat Transfer and Global Interactions Solar Energy
2 Earth's Resources/Materials	
3.3.10.A2. Grade 10	

Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources of energy.	Air Pollution The Carbon Cycle Climate Change Greenhouse Gases Fossil Fuels Solar Energy
3.3.12.A2. Grade 12	
Analyze the availability, location, and extraction of Earth's resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system.	The Carbon Cycle Climate Change Crude Oil Formation of Fossil Fuels Fossil Fuels Greenhouse Gases Nuclear Fission Solar Energy
3 Earth's History	
3.3.10.A3. Grade 10	
Explain how the evolution of Earth has been driven by interactions between the lithosphere, hydrosphere, atmosphere, and biosphere.	The Atmosphere Earth's Structure Plate Tectonics
3.3.12.A3. Grade 12	
Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships.	Fossil Record Radioactive Dating
4 Sciences and Transfer of Energy	
3.3.10.A4. Grade 10	
Relate geochemical cycles to conservation of matter.	The Carbon Cycle The Nitrogen Cycle The Water Cycle
Explain how the Earth's systems and its various cycles are driven by energy.	The Carbon Cycle The Nitrogen Cycle The Water Cycle
3.3.12.A4. Grade 12	
Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy.	Heat Transfer and Global Interactions Solar Energy
Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.	Conduction and Convection Heat Transfer and Global Interactions Weather and Climate

5 Water	
3.3.10.A5. Grade 10	
<i>Explain how there is only one ocean.</i>	–
Explain the processes of the hydrologic cycle.	The Water Cycle
Explain the dynamics of oceanic currents and their relationship to global circulation within the marine	Heat Transfer and Global Interactions
3.3.12.A5. Grade 12	
Explain how the ocean dominates the Earth’s carbon cycle.	The Carbon Cycle
6 Weather and Climate	
3.3.10.A6. Grade 10	
Interpret meteorological data to describe and/or predict weather.	Measuring the Weather
	Heat Transfer and Global Interactions Tropical Cyclones Precipitation
Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.	
3.3.12.A6. Grade 12	
	ENSO Heat Transfer and Global Interactions The Rotation of the Earth Weather and Climate
Explain how the unequal heating of the Earth’s surface leads to atmospheric global circulation changes, climate, local short term changes, and weather.	
	Conduction and Convection Heat Transfer and Global Interactions
Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.	
7 Unifying Themes	
3.3.10.A7. Grade 10	
SCALE/MODELS	
Interpret and create models of the Earth’s physical features in various mapping representations.	Relief
	The Carbon Cycle The Nitrogen Cycle Recycling Nutrients The Water Cycle
CONSTANCY AND CHANGE	
Relate constancy and change to the hydrologic and geochemical cycles.	
SCALE	
<i>Apply an appropriate scale to illustrate major events throughout geologic time.</i>	–
	Air Pollution The Carbon Cycle Climate Change Fossil Fuels Greenhouse Gases
CONSTANCY/CHANGE	
Describe factors that contribute to global climate change.	
3.3.12.A7. Grade 12	

MODELS <i>Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections.</i>	-
CONSTANCY/CHANGE Infer how human activities may impact the natural course of Earth's cycles.	The Carbon Cycle The Nitrogen Cycle Recycling Nutrients The Water Cycle
PATTERNS <i>Summarize the use of data in understanding seismic events, meteorology, and geologic time.</i>	-
3.3.B. Origin and Evolution of the Universe	
1 Composition and Structure	
3.3.10.B. Grade 10	
Explain how gravity is responsible for planetary orbits.	Gravity and Orbits
Explain what caused the sun, Earth, and most of the other planets to form between 4 and 5 billion years ago.	Planets of the Solar System
Provide evidence to suggest the Big Bang Theory.	Doppler Effect Observing the Universe
Describe the basic nuclear processes involved in energy production in a star.	Nuclear Fusion The Life Cycle of Stars Properties of Stars
3.3.12.B. GRADE 12	
Describe the life cycle of stars based on their mass.	The Life Cycle of Stars Properties of Stars
Analyze the influence of gravity on the formation and life cycles of galaxies, including our own Milky Way galaxy; stars; planetary systems; and residual material left from the creation of the solar system.	Planets of the Solar System The Life Cycle of Stars
Relate the nuclear processes involved in energy production in stars and supernovas to their life cycles.	The Life Cycle of Stars Properties of Stars
2 Unifying Themes	
3.3.10.B. GRADE 10	
SCALE AND MEASUREMENT Explain how scientists obtain information about the universe by using technology to detect electromagnetic radiation that is emitted, reflected, or absorbed by stars and other	Doppler Effect Observing the Universe
CONSTANCY AND CHANGE Describe changes in the universe over billions of years.	Planets of the Solar System Astronomical Distances
SCALE AND MEASUREMENT Explain the scale used to measure the sizes of stars and galaxies and the distances between them.	Astronomical Distances
3.3.12.B. Grade 12	
MODELS AND SCALE Apply mathematical models and computer simulations to study evidence collected relating to the extent and composition of the universe.	Observing the Universe

PATTERNS AND CONSTANCY AND CHANGE

Analyze the evidence supporting theories of the origin of the universe to predict its future.

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