

## Curriculum Map: Next Generation Science Grade 5 2020

Course: SCIENCE/HLTH 5 Sub-topic: General

Grade(s): 5

### Course

#### Description:

The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?" Fifth grade performance expectations include PS1, PS2, PS3, LS1, LS2, ESS1, ESS2, and ESS3 Disciplinary Core Ideas from the NRC Framework. Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

### Unit: Life Science - Matter and Energy in Organisms and Ecosystems

Timeline: Week 1 to 12

**Description:** August-November

#### Skills:

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. (Clarification Statement: Examples of models could include diagrams, and flow charts.)

5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. (Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.)

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.)

#### Essential Questions:

How do organisms live, grow, respond to their environment, and reproduce?

How and why do organisms interact with their environment and what are the effects of these interactions.

How are the characteristics of one generation passed to the next? How can individuals of the same siblings have different characteristics?

How can there be so many similarities among organisms yet so many different kinds of

plants, animals, and microorganisms?

**Content:** All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

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.

Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

**Vocabulary:** Food chain  
Food web  
Argument  
Evidence  
Minerals  
Ecosystem  
Food webs  
Researchable  
Species  
Web of life  
Transfer energy  
Invasive  
Noninvasive  
System  
Cycles  
Matter  
Microbes  
Decomposers  
Decomposition  
Components  
System models

**STANDARDS: STANDARDS**

STATE: Pennsylvania State Anchors (2010)

S5.B.1 (Advanced) Structure and Function of Organisms

S5.B.1.1 (Advanced) Describe how the cell is the basic unit of structure and function for all living things.

S5.B.1.1.1 (Advanced) Recognize that all organisms are composed of cells.

S5.B.1.1.2 (Advanced) Explain the concept of the cell as the basic structural unit of

all living things.

(\* standards consolidated from Topic level)

**Topic: Lesson 1**

Minutes for Topic: 45

**Core Lesson Description:** Food provides animals with materials needed for body repair and growth. (PS3.D)

**Core Lesson Student Learning Objectives:** Students will use a model to describe that energy in animal's food was once energy from the sun. (5-PS3-1)

**Core Lesson Essential Questions:** How do organisms live, grow, respond to their environment, and reproduce?

**Core Lesson Big Ideas:** All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

**Core Lesson Key Terminology & Definitions:** Food chain  
Food web

**STANDARDS**

STATE: [Pennsylvania State Anchors \(2010\)](#)

[S5.B.1 \(Advanced\)](#) Structure and Function of Organisms

[S5.B.1.1 \(Advanced\)](#) Describe how the cell is the basic unit of structure and function for all living things.

[S5.B.1.1.1 \(Advanced\)](#) Recognize that all organisms are composed of cells.

[S5.B.1.1.2 \(Advanced\)](#) Explain the concept of the cell as the basic structural unit of all living things.

**Topic: Lesson 2**

Minutes for Topic: 45

**Core Lesson Description:** Food provides animals with materials needed for energy and to maintain body warmth and for motion. (LS1.C)

**Core Lesson Student Learning Objectives:** Students will use a model to describe that energy in animal's food was once energy from the sun. (5-PS3-1)

**Core Lesson Essential Questions:** How do organisms live, grow, respond to their environment, and reproduce?

**Core Lesson Big Ideas:** All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

**Core Lesson Key Terminology & Definitions:** Food chain  
Food web

## STANDARDS

STATE: Pennsylvania State Anchors (2010)

[S5.B.1 \(Advanced\)](#)

Structure and Function of Organisms

[S5.B.1.1 \(Advanced\)](#)

Describe how the cell is the basic unit of structure and function for all living things.

[S5.B.1.1.1 \(Advanced\)](#)

Recognize that all organisms are composed of cells.

[S5.B.1.1.2 \(Advanced\)](#)

Explain the concept of the cell as the basic structural unit of all living things.

### Topic: Lesson 3

Minutes for Topic: 45

#### **Core Lesson Description:**

Plants acquire their material from growth primarily from air and water. (LS1.C)

#### **Core Lesson Student Learning Objectives:**

Students use evidence, present an argument that plants get the materials they need for growth primarily from air and water. (5-PS3-1)

#### **Core Lesson Essential Questions:**

How do organisms live, grow, respond to their environment, and reproduce?

#### **Core Lesson Big Ideas:**

All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

#### **Core Lesson Key Terminology & Definitions:**

Argument

Evidence

Minerals

### Topic: Lesson 4

Minutes for Topic: 45

#### **Core Lesson Description:**

Animals and plants alike take in gases and water and release waste matter into the environment; animals must take in food, and plants need light and minerals. (LS2.B)

#### **Core Lesson Student Learning Objectives:**

Students will construct and communicate models of food webs that demonstrate the transfer of matter and energy among organisms within an ecosystems. (5-LS2-1)

#### **Core Lesson Essential Questions:**

How do organisms live, grow, respond to their environment, and reproduce?

#### **Core Lesson Big Ideas:**

All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

#### **Core Lesson Key Terminology & Definitions:**

Ecosystem

Food webs

### Topic: Lesson 5

Minutes for Topic: 45

**Core Lesson Description:** Organisms can survive only in environments in which their particular needs are met. (LS2.A)

**Core Lesson Student Learning Objectives:** Students will ask researchable questions about the ways organisms obtain matter and energy across multiple and varied ecosystems. (5-LS2-1)

**Core Lesson Essential Questions:** How and why do organisms interact with their environment and what are the effects of these interactions?

**Core Lesson Big Ideas:** Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

**Core Lesson Key Terminology & Definitions:** Researchable  
Species  
Web of life

### Topic: Lesson 6

Minutes for Topic: 45

**Core Lesson Description:** A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. (LS2.A)

**Core Lesson Student Learning Objectives:** Students will construct a model of a food web to demonstrate the transfer of matter and energy among organisms within an ecosystem. (5-LS2-1)

**Core Lesson Essential Questions:** How and why do organisms interact with their environment and what are the effects of these interactions?

**Core Lesson Big Ideas:** Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

**Core Lesson Key Terminology & Definitions:** Ecosystem  
Transfer energy

### Topic: Lesson 7

Minutes for Topic: 45

**Core Lesson Description:** Newly introduced species can damage the balance of an ecosystem. (LS2.A)

**Core Lesson Student Learning Objectives:** Students will identify a newly introduced species to an ecosystem and provide evidence that it is an invasive species or noninvasive species. (5-LS2-1)

**Core Lesson Essential Questions:** How and why do organisms interact with their environment and what are the effects of these interactions?

**Core Lesson Big Ideas:** Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

**Core Lesson Key Terminology & Definitions:** Ecosystem  
Invasive

Noninvasive

Species

System

### Topic: Lesson 8

Minutes for Topic: 45

**Core Lesson Description:** Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. (LS2.B)

**Core Lesson Student Learning Objectives:** Students will use models to trace the cycling of particles of matter between the air and soil and among plants, animals, and microbes. (5-LS2-1)

**Core Lesson Essential Questions:** How and why do organisms interact with their environment and what are the effects of these interactions?

**Core Lesson Big Ideas:** Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

**Core Lesson Key Terminology & Definitions:** Cycles  
Matter  
Microbes

### Topic: Lesson 9

Minutes for Topic: 45

**Core Lesson Description:** Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. (LS2.B)

**Core Lesson Student Learning Objectives:** Students use models to describe how decomposition eventually restores (recycles) some materials back to the soil for plants to use. (5-LS2-1)

**Core Lesson Essential Questions:** How and why do organisms interact with our environment and what are the effects of these interactions?

**Core Lesson Big Ideas:** Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

**Core Lesson Key Terminology & Definitions:** Decomposers  
Decomposition  
Microbes

### Topic: Lesson 10

Minutes for Topic: 45

**Core Lesson Description:** A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. (LS2.A)

**Core Lesson**

**Student Learning Objectives:** Students will describe a healthy ecosystem as a system in terms of the components and interactions. (5-LS2-1)

**Core Lesson Essential Questions:** How and why do organisms interact with their environment and what are the effects of these interactions?

**Core Lesson Big Ideas:** Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

**Core Lesson Key Terminology & Definitions:** Ecosystem  
Components  
System  
System models

### Topic: Lesson 11

Minutes for Topic: 45

**Core Lesson 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 characteristics/

**Core Lesson Big Ideas:** 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.

### Topic: Lesson 12

Minutes for Topic: 45

**Core Lesson Essential Questions:** How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

**Core Lesson Big Ideas:** Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

## Unit: Earth and Space Science

Timeline: 11 Weeks

**Description:** November-February

**Essential Questions:** What is the universe, and what is Earth's place in it?

How and why is Earth constantly changing?

How do Earth's processes and human activities affect each other?

**Content:** 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.

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.

The Earth's processes affect and are affected by human activities.

**Vocabulary:** Relative distance  
Stars  
Sun  
Apparent brightness  
Earth  
Data  
Graphical display  
Patterns  
Representation  
Shadows  
Atmosphere  
Biosphere  
Chemical change  
Energy flow  
Geosphere  
Hydrosphere  
Model  
Physical change  
Weather  
Distribution  
Precipitation  
Transpiration  
Water cycle  
Water system  
Human impact  
Research  
Resources

**Topic: Lesson 1**

Minutes for Topic: 45

**Core Lesson Description:** The sun is a star that appears larger and brighter than other stars because it's closer. (ESS1.A)

**Core Lesson Student Learning Objectives:** Students will support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. (5-ESS1-1)

**Core Lesson**

**Essential Questions:** What is the universe, and what is Earth's place in it?

**Core Lesson Big Ideas:** The universes is composed of a variety of different objects, which are organized into systems each of, which develops according to accepted physical processes and laws.

**Core Lesson Key Terminology & Definitions:** Relative distance  
Stars  
Sun

### Topic: Lesson 2

Minutes for Topic: 45

**Core Lesson Description:** Stars range greatly in their distance from Earth. (ESS1.A)

**Core Lesson Student Learning Objectives:** Students will support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. (5-ESS1-1)

**Core Lesson Essential Questions:** What is the universe, and what is Earth's place in it?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Apparent brightness  
Earth  
Relative distance  
Stars  
Sun

### Topic: Lesson 3

Minutes for Topic: 45

**Core Lesson Description:** The orbits of Earth around the sun and of the moon around Earth, together with rotation of Earth about an axis between its North and South poles, cause observable patterns (e.g., day and night, length and direction of, different positions of sun, moon and stars). (ESS1.B)

**Core Lesson Student Learning Objectives:** Students will represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows day and night, and seasonal appearance of stars in the sky. (5-ESS1-2)

**Core Lesson Essential Questions:** What is the universe, and what is Earth's place in it?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Data  
Graphical display  
Patterns  
Representation  
Shadows

#### Topic: Lesson 4

Minutes for Topic: 45

**Core Lesson Description:** All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. The energy is derived from the sun and the earth's interior. These flows and cycles produce chemical and physical changes in Earth's materials and living organisms.(ESS2.A)

**Core Lesson Student Learning Objectives:** Students will construct and analyze models to describe systems interactions among the geosphere, hydrosphere, atmosphere, and biosphere. ((5-ESS2-1)

**Core Lesson Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Atmosphere  
Biosphere  
Chemical change  
Energy flow  
Geosphere  
Hydrosphere  
Model  
Physical change

#### Topic: Lesson 5

Minutes for Topic: 45

**Core Lesson Description:** All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. The energy is derived from the sun and the earth's interior. These flows and cycles produce chemical and physical changes in Earth's materials and living organisms. (ESS2.A)

**Core Lesson Student Learning Objectives:** Through the creation of a model students will explain that the chemical and physical processes that cycle earth materials and form rocks. (5-ESS2-1)

**Core Lesson Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Atmosphere  
Biosphere  
Chemical change  
Energy flow

Geosphere  
Hydrosphere  
Model  
Physical change

### Topic: Lesson 6

Minutes for Topic: 45

**Core Lesson Description:** Earth's major systems are the geosphere, hydrosphere, and biosphere, which interact in multiple ways to affect the Earth's surface materials and processes. (ESS2.A)

**Core Lesson Student Learning Objectives:** Students will develop a model to describe the ways the geosphere, hydrosphere, and biosphere interact. This could include the influence of atmosphere on landforms and ecosystems through weather and climate, mountain ranges on winds and clouds, etc. (5-ESS2-1)

**Core Lesson Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Atmosphere  
Biosphere  
Geosphere  
Hydrosphere

### Topic: Lesson 7

Minutes for Topic: 45

**Core Lesson Description:** The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. (ESS2.A)

**Core Lesson Student Learning Objectives:** Students will develop a model to describe the ways the geosphere, hydrosphere, and biosphere interact. (5-ESS2-1)

**Core Lesson Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Atmosphere  
Biosphere  
Geosphere  
Hydrosphere

### Topic: Lesson 8

Minutes for Topic: 45

**Core Lesson Description:** Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (ESS2.A)

**Core Lesson Student Learning Objectives:** Utilizing observations and data, students will explain the patterns of weather in a given location. (5-ESS2-1)

**Core Lesson**

**Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Weather

**Topic: Lesson 9**

Minutes for Topic: 45

**Core Lesson Description:** Most fresh water is in glaciers or underground with the remainder in streams, lakes, wetlands, and atmosphere. (ESS2.C)

**Core Lesson Student Learning Objectives:** Using real time data, students will graph amounts of water in various reservoirs to provide evidence about the distribution of water on earth. (5-ESS2-2)

**Core Lesson Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Distribution

**Topic: Lesson 10**

Minutes for Topic: 45

**Core Lesson Description:** Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation as well as downhill flows on land.

**Core Lesson Student Learning Objectives:** Students will investigate movement of water in the Earth's systems and research and develop models for the cycling of water.

**Core Lesson Essential Questions:** How and why is Earth constantly changing?

**Core Lesson Big Ideas:** 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.

**Core Lesson Key Terminology & Definitions:** Atmosphere Precipitation  
Transpiration  
Water cycle  
Water system

**Topic: Lesson 11**

Minutes for Topic: 45

**Core Lesson Description:** Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, ocean, and air. (ESS3.C)

**Core Lesson Student Learning Objectives:** Students will research and communicate how communities are using science to protect resources and environments. (5-ESS3-1)

**Core Lesson Essential Questions:** How do Earth's processes and human activities affect each other?

**Core Lesson Big Ideas:** The Earth's processes affect and are affected by human activities.

**Core Lesson Key Terminology & Definitions:** Atmosphere  
Human impact  
Research  
Resources

## **Unit: Physical Science - Matter and Energy in Organisms and Ecosystems**

Timeline: 9 Weeks

**Description:** February-May

**Essential Questions:** How can one explain the structure, properties, and interactions of matter?  
How can one explain and predict interactions between objects within systems?  
How is energy transferred and conserved?  
How are waves used to transfer energy and information?

**Content:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.  
  
Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.  
  
Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

**Vocabulary:** Chemical change vs. physical change  
Mass  
Temperature  
Volume  
Condensation  
Evaporation  
Matter  
Particles  
Hardness  
Moh's scale  
Porosity  
Properties

Solubility  
Streak tests  
Conservation of mass  
Mixtures vs. compounds  
dissolve  
gravitational force  
energy flow  
flow chart  
model  
photosynthesis

**STANDARDS: STANDARDS**

STATE: Pennsylvania SAS Academic Standards (2009-2013)

[4.1.7.C \(Advanced\)](#) Explain the flow of energy within an ecosystem.

- Compare and contrast the flow of energy between organisms in different habitats.
- Explain the concept of trophic levels.

[3.1.6.A2 \(Advanced\)](#) Describe how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain from producers (plants) to consumers to decomposers.

[3.2.3.A4 \(Advanced\)](#) Use basic reactions to demonstrate observable changes in properties of matter (e.g., burning, cooking).

[3.2.5.A4 \(Advanced\)](#) Not covered for this grade.

[3.2.5.A6 \(Advanced\)](#) Science as Inquiry

- Understand how theories are developed.
- Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.
- Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.
- Describe relationships using inference and prediction.
- Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.
- Analyze alternative explanations and understand that science advances through legitimate skepticism.
- Use mathematics in all aspects of scientific inquiry.
- Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

[3.2.6.A4 \(Advanced\)](#) Differentiate between physical changes and chemical changes.

[3.2.7.A4 \(Advanced\)](#) Describe how reactants change into products in simple chemical reactions.

[3.3.6.A3 \(Advanced\)](#) Not covered for this grade.

[3.3.7.B1 \(Advanced\)](#) Explain how gravity is the major force in the formation of the planets, stars, and the solar system. Describe gravity as a major force in determining the motions of planets, stars, and the solar system. Compare and contrast properties and

conditions of objects in the solar system to those on Earth.

### Topic: Lesson 1

Minutes for Topic: 45

**Core Lesson Description:** When two or more different substances are mixed, a new substance with different properties may be formed. (PS1.B)

**Core Lesson Student Learning Objectives:** Students will plan and conduct an investigation to determine whether the mixing of two or more substances results in new substances (e.g., cooking, baking, burning, etc.). (5-PS1-4)

**Core Lesson Essential Questions:** How can one explain the structure, properties, and interactions of matter?

**Core Lesson Big Ideas:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

**Core Lesson Key Terminology & Definitions:** Chemical change vs. physical change  
Mass  
Temperature Volume

### STANDARDS

STATE: [Pennsylvania SAS Academic Standards \(2009-2013\)](#)

[3.2.3.A4 \(Advanced\)](#) Use basic reactions to demonstrate observable changes in properties of matter (e.g., burning, cooking).

[3.2.5.A6 \(Advanced\)](#) Science as Inquiry

- Understand how theories are developed.
- Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.
- Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.
- Describe relationships using inference and prediction.
- Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.
- Analyze alternative explanations and understand that science advances through legitimate skepticism.
- Use mathematics in all aspects of scientific inquiry.
- Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

### Topic: Lesson 2

Minutes for Topic: 45

**Core Lesson Description:** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. (PS1.A)

**Core Lesson Student Learning Objectives:** Students will develop a model to describe that matter is made of particles too small to be seen. (5-PS1-1)

**Core Lesson Essential Questions:** How can one explain the structure, properties, and interactions of matter?

**Core Lesson Big Ideas:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

**Core Lesson Key Terminology & Definitions:** Condensation  
Evaporation  
Matter  
Particles

## STANDARDS

STATE: Pennsylvania SAS Academic Standards (2009-2013)

3.2.5.A6 (Advanced) Science as Inquiry

- Understand how theories are developed.
- Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.
- Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.
- Describe relationships using inference and prediction.
- Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.
- Analyze alternative explanations and understand that science advances through legitimate skepticism.
- Use mathematics in all aspects of scientific inquiry.
- Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

### Topic: Lesson 3

Minutes for Topic: 45

**Core Lesson Description:** Measurements of a variety of properties can be used to identify materials. (PS1.A)

**Core Lesson Student Learning Objectives:** Students will make observations and measurements to identify given materials based on their properties. ((5-PS1-3)

**Core Lesson Essential Questions:** How can one explain the structure, properties, and interactions of matter?

**Core Lesson Big Ideas:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

**Core Lesson Key Terminology & Definitions:** Hardness  
Mass  
Moh's scale  
Porosity  
Properties  
Solubility  
Streak tests  
Volume

## STANDARDS

STATE: Pennsylvania SAS Academic Standards (2009-2013)

3.2.5.A6 (Advanced) Science as Inquiry

- Understand how theories are developed.
- Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.
- Design and conduct a scientific investigation and understand that current scientific

knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations. • Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories. • Analyze alternative explanations and understanding that science advances through legitimate skepticism. • Use mathematics in all aspects of scientific inquiry. • Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

#### Topic: Lesson 4

Minutes for Topic: 45

**Core Lesson Description:** The amount of matter is conserved when it changes form. (PS1.A)

**Core Lesson Student Learning Objectives:** Students will measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total mass of matter is conserved. (5-PS1-2)

**Core Lesson Essential Questions:** How can one explain the structure, properties, and interactions of matter?

**Core Lesson Big Ideas:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

**Core Lesson Key Terminology & Definitions:** Conservation of mass

#### STANDARDS

STATE: [Pennsylvania SAS Academic Standards \(2009-2013\)](#)

[3.2.5.A6 \(Advanced\)](#) Science as Inquiry

• Understand how theories are developed. • Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions. • Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations. • Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories. • Analyze alternative explanations and understanding that science advances through legitimate skepticism. • Use mathematics in all aspects of scientific inquiry. • Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

#### Topic: Lesson 5

Minutes for Topic: 45

**Core Lesson Description:** When two or more different substances are mixed, a new substance with different properties may be formed; such occurrences depend on the substances and the temperature. (PS1.B)

**Core Lesson Student Learning Objectives:** Students will investigate the interaction of two or more substances to provide evidence that when different substances are mixed, one or more new substances with different properties may or may not be formed. (5-PS1-4)

**Core Lesson Essential Questions:** How can one explain the structure, properties, and interactions of matter?

**Core Lesson Big Ideas:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

**Core Lesson Key Terminology & Definitions:** Chemical change Mixtures vs. compounds

## STANDARDS

STATE: [Pennsylvania SAS Academic Standards \(2009-2013\)](#)

[3.2.6.A4 \(Advanced\)](#) Differentiate between physical changes and chemical changes.

[3.2.7.A4 \(Advanced\)](#) Describe how reactants change into products in simple chemical reactions.

### Topic: Lesson 6

Minutes for Topic: 45

**Core Lesson Description:** No matter what reaction or change in properties occurs, the total mass of the substances does not change. (PS1.B)

**Core Lesson Student Learning Objectives:** Students will plan and carry out investigations to determine the effect on the total mass of a substance when the substance changes shape, phase, and/or is dissolved. (5-PS1-2)

**Core Lesson Essential Questions:** How can one explain the structure, properties, and interactions of matter?

**Core Lesson Big Ideas:** Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

**Core Lesson Key Terminology & Definitions:** Chemical change  
Dissolve Physical changes

## STANDARDS

STATE: [Pennsylvania SAS Academic Standards \(2009-2013\)](#)

[3.2.5.B5 \(Advanced\)](#) Compare the characteristics of sound as it is transmitted through different materials. Relate the rate of vibration to the pitch of the sound.

### Topic: Lesson 7

Minutes for Topic: 45

**Core Lesson Description:** \*Gravitational force of Earth acting on another object near Earth's surface pulls that object toward the planet's center. (PS2.B)  
\*Earth and Space Science

**Core Lesson Student Learning Objectives:** Students will \*Construct and support an argument that the gravitational force exerted by Earth on objects is directed down. (5-PS2-1)  
\*Earth and Space Science

**Core Lesson Essential Questions:** How can one explain and predict interactions between objects within systems?

**Core Lesson Big Ideas:** Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

**Core Lesson Key Terminology & Definitions:** Gravitational force

## STANDARDS

STATE: Pennsylvania SAS Academic Standards (2009-2013)

[3.3.6.B1 \(Advanced\)](#) Compare and contrast the size, composition, and surface features of the planets that comprise the solar system as well as the objects orbiting them.

Recognize the role of gravity as a force that pulls all things on or near the earth toward the center of the earth and in the formation of the solar system and the motions of objects in the solar system. Explain why the planets orbit the sun in nearly circular paths. Describe how the planets change their position relative to the background of the stars. Explain how the tilt of the earth and its revolution around the sun cause an uneven heating of the earth which in turn causes the seasons and weather patterns.

[3.3.7.B1 \(Advanced\)](#) Explain how gravity is the major force in the formation of the planets, stars, and the solar system. Describe gravity as a major force in determining the motions of planets, stars, and the solar system. Compare and contrast properties and conditions of objects in the solar system to those on Earth.

## Topic: Lesson 8

Minutes for Topic: 45

**Core Lesson Description:** \*\*Energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter. (PS3.D)  
\*\*Life Science

**Core Lesson Student Learning Objectives:** Students will \*\*Use a model to describe that energy in animal's food was once energy from the sun. (5-PS3-1)  
\*\*Life Science

**Core Lesson Essential Questions:** How is energy transferred and conserved?

**Core Lesson Big Ideas:** Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

**Core Lesson Key Terminology & Definitions:** Energy flow  
Flow chart  
Model  
Photosynthesis

## STANDARDS

STATE: Pennsylvania SAS Academic Standards (2009-2013)

[4.1.7.C \(Advanced\)](#) Explain the flow of energy within an ecosystem.

- Compare and contrast the flow of energy between organisms in different habitats.
- Explain the concept of trophic levels.

## Topic: Lesson 9

Minutes for Topic: 45

**Core Lesson Essential Questions:** How are waves used to transfer energy and information?

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

