Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe educational environment for all students to attain the skills and knowledge specified in the New Jersey Core Curriculum Content Standards at all grade levels so as to ensure their full participation in our global society as responsible, self-directed, and civic-minded citizens.*

Course Title:	Science
Grade Level(s):	7th

Duration:	*Full Year:*	X	*Semester:*		*Marking Period:*	
Course Description:	The Washington Township School District seventh grade science curriculum uses an integrated approach to general science that focuses with units on physical, life, and earth science. By using this approach, teachers are able to meets the needs of all students while aligning with the New Jersey Model Curriculum and the Next Generation Science Standards. Hands on activities are stressed and include student discovery, laboratory experiments, problem solving, model building, cooperative learning, computer usage, classroom discussion, teacher demonstrations, and writing opportunities for research and self-expression. Interdisciplinary subject areas are incorporated whenever possible. Students are introduced to the use of scientific tools and methods used for investigations.					
Grading Procedures:	Tests – 35% Quizzes – 20% Labs/Projects - 30% Homework/Class work – 15%					
Primary Resources:	Pearson Realize 21st Century Learner Framework					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	Karen Carola and Melissa Polimeni

Under the Direction of:	Dr. Patricia Hughes

Written: _____

Revised: _____

BOE Approval: _____

Unit Title: Physical Science - Introduction to Chemistry

Unit Description: Students will be introduced to chemistry through three chapters of science instruction. Students will learn about the three states of matter, how matter changes states, and how gas behaves, including Charles's and Boyle's Laws. In the second chapter, students will learn about atoms and bonding, including the periodic table, ionic and covalent bonds, and bonding in metals. The introduction to chemistry will end with chemical reactions. Students will observe chemical changes and finish the unit by describing and controlling chemical reactions.

Unit Duration: about 4 weeks

Desired Results

Standard(s):

Chapter 1 – Solids, Liquids, and Gases – MS–PS1–2; MS–PS1–4
Chapter 2 – Atoms and Bonding – MS–PS1–1
Chapter 3 – Chemical Reactions – MS–PS1–5; MS–PS1–6

Indicator(s):

Chapter 1 – PS1.A Structures and Properties of Matter, PS1.B Chemical Reactions, PS3.A Definitions of Energy
Chapter 2 – PS1.A Structures and Properties of Matter
Chapter 3 – PS1.B Chemical Reactions, ETS1.B Developing Possible Solutions, ETS1.C Optimizing the Design Solution

Understandings:

Students will ……

Chapter 1
Lesson 1

- Apply scientific principles to describe the motion of particles in a solid.
- Construct a scientific explanation based on evidence to describe the motion of particles in a liquid.
- Use mathematical representations to describe the motion of particles in a gas.

Lesson 2

- Construct a scientific explanation based on evidence to describe what happens to a substance during changes between solid and liquid.
- Apply scientific principles to explain what happens to a substance during changes between liquid and gas.
- Gather and synthesize information to explain what happens during changes between a solid and gas.

Lesson 3

- Apply scientific principles to explain how pressure and temperature of a gas are related.
- Use mathematical representations to explain how volume and temperature of a gas are related.
- Develop and use models to explain how pressure and volume of a gas are related.

Chapter 2
Lesson 1

- Gather and synthesize information to describe a model of the atom.

Essential Questions:

Chapter 1 - Solids, Liquids, and Gases

- Why does a substance change states?

Chapter 2 - Atoms and Bonding

- How can bonding determine the properties of a substance?

Chapter 3 - Chemical Reactions

- How is matter conserved in a chemical reaction?

• Construct a scientific explanation based on evidence to describe what determines an element's chemistry. *Lesson 2* • Gather and synthesize information to describe how ions form. • Use mathematical representations to explain how the formulas and names of ionic compounds are written. • Gather and synthesize information to identify properties of ionic compounds. *Lesson 3* • Develop and use models to describe how atoms are held together in a covalent bond. • Apply scientific principles to identify the properties of molecular compounds. • Apply scientific principles to explain how bonded atoms become partially charged. *Lesson 4* • Develop and use models to describe the structure of a metal crystal. • Gather and synthesize information to identify the properties of metals. *Chapter 3* *Lesson 1* • Construct a scientific explanation based on evidence to describe changes in matter. • Apply scientific principles to identify ways to tell that a chemical reaction occurred. *Lesson 2* • Develop and use models to identify the information included in a chemical reaction. • Apply scientific principles to explain how mass is conserved during a chemical reaction. • Use mathematical representations to identify three categories of chemical reactions. *Lesson 3* • Apply scientific principles to explain how activation energy is related to chemical reactions. • Gather and synthesize information to identify factors that affect the rate of a chemical reaction.	

Assessment Evidence

Performance Tasks: (Expectation Activities)	Other Evidence:
• Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. • Develop models to describe the atomic composition of simple molecules and extended structures. • Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	Lesson quizzes, Chapter Tests, Labs Performance Assessments • Chapter 1 – Balloon Graph • Chapter 2 – Bonds and Compounds • Chapter 3 – Chemical Reactions Chapter 1 **Lab –** Melting Ice (Vernier Temperature Probe Lab) Chapter 2 **Lab –** Shedding Light on Ions (Vernier Conductivity Probe Lab)

Benchmarks: to be determined	

Learning Plan

Learning Activities:

Chapter 1 - Solids, Liquids and Gases

Lesson 1 – States of Matter (1-2 class periods)

- Read My Planet Diary as a class.
- Students will do the Warm Up Activity and complete the After the Inquiry Warm Up worksheet.
- Introduce vocabulary.
- Describe a solid and the types of solids.
- Explain why liquids have definite volume but not definite shape.
- Observe figure 4 and explain surface tension.
- Describe viscosity and use Quick Lab (As Thick as Honey) Lead a discussion about viscosity.
- Explain why a gas does not have definite shape or volume.
- Discuss the mathematical relationship between pressure and force.
- Review terms – Key Concept Summaries and Review and Reinforce Worksheet

Lesson 2 – Changes of State (1-2 class periods)

- Read and discuss My Planet Diary as a class.
- Students will do the Warm Up Activity and complete the After the Warm Up worksheet.
- Discuss the relationship between the melting point and the freezing point of a substance.
- Students will complete the Apply it ideas and share their comparisons.
- Students will explain what happens when the particles in a liquid gain enough energy to move independently. Student will give examples of when a gas changes to a liquid.
- Explain sublimation.
- Explore the Big Q – discuss what happens to water when it changes states of matter. Have students respond to the Big Q
- Use Key Concept Summaries to Review

Lesson 3 – Gas Behavior (1-2 class periods)

- Read and discuss My Planet Diary as a class.
- Students will do Inquiry Warm Up Activity and complete the After the Inquiry Warm-Up worksheet and discuss the results of the activity.
- Describe what happens to the pressure of gas when the temperature increases and decreases.
- Support the Big Q by reviewing what happens to solids, liquids and gases when thermal energy is added to them.
- Explain Charles's Law and use figure 2 to show how the volume of a balloon fluctuates when it is cooled and warmed.
- Explain Boyle's Law
- Discuss how the 3 properties of a gas are measured and can be studied.
- Use Key Concepts Summaries to Review

Chapter 2 - Atoms and Bonding

Lesson 1 – Atoms, Bonding, and the Periodic Table (2-3 class periods)

- Read and discuss My Planet Diary as a class.
- Have students share ideas about what they think gives fireworks their colors. Then have students do the Inquiry Warm-Up activity. Students will investigate the trends in the periodic table. Discuss the information in the periodic table about each element. The After the Inquiry Warm-Up worksheet sets up a discussion about how you can determine the number of protons, electrons, and neutrons using what you know about the periodic table.
- Have volunteers share their answers to question 4 about how many electrons are in a phosphorous atom.
- Teach Key Concepts by explaining that valence electrons are involved in chemical bonding. Use Figure 1 to show how many valence electrons are associated with an element.
- Lead a Discussion about how the elements in the periodic table are arranged in order of increasing atomic number. Use Figure 2 to show students the pattern for determining the number of valence electrons in atoms.

- Have students look back at Figure 2 to realize the elements in the same group have the same number of valence electrons.
- Use the Support the Big Q to illustrate how noble gases differ from all the other groups. Then have students practice the inquiry skill in the Apply It activity. Lead a Discussion about what happens to valence electrons of metals and nonmetals when they bond with other atoms. Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Ionic Bonds (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share ideas about what elements give colors to paints.
- Then have students do the Inquiry Warm-Up activity. Students will learn how ions form. Discuss the charge of the electrons. The After the Inquiry Warm-Up worksheet sets up a discussion about what happens to the charge when electrons are exchanged to form ions. Have volunteers share their answers to question 4 about why the electrons moved from group to group but the protons did not.
- Teach Key Concepts by explaining that when an atom loses one of its electrons, it becomes a positively charged ion while the atom that gains the electron becomes a negatively charged ion. Use Figure 1 to illustrate what happens when an atom loses or gains an electron.
- Lead a Discussion about the idea that opposites attract. Use Figure 2 to identify the proper group for various ion. Figure 3 illustrates how ionic bonds are formed. Have students complete the maze and draw the electron dot diagrams for the ionic compounds.
- Continue to Teach Key Concepts by explaining the rules for writing the formulas for ionic compounds and then describe how names of ionic compounds are determined.
- Lead a Discussion about superscripts and subscripts. Then have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by asking what are the properties of the ionic compounds that form when metals and nonmetals react. Use Figure 5 to show ionic compounds are made up of oppositely charged ions, not individual pairs of ions.
- Review the formula for lead sulfide before the Apply It activity.
- Use the Support the Big Q to illustrate electrical conductivity of ionic compounds.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Covalent Bonds (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share ideas about why geckos are such extraordinary climbers. Then have students do the Inquiry Warm-Up activity.
- Students will investigate the charges of covalent bonds in molecules of water. Discuss what happened each time the rod was placed near the water.
- The After the Inquiry Warm-Up worksheet sets up a discussion about whether a stream of liquid with covalent bonds is attracted to negatively charged objects. Have volunteers share their answers to question 4 about how a stream of liquid with covalent bonds reacts to positively charged objects.
- Teach Key Concepts by explaining how atoms can share electrons instead of giving them away. Use Figure 1 to show how electrons can be shared between atoms to form molecules.
- Have students use the periodic table to identify how many valence electrons an iodine atom has before doing the Apply It activity. Use Figure 2 to show students how single, double, and triple bonds can be formed.
- Continue to Teach Key Concepts by comparing the properties of molecular compounds and ionic compounds.
- Teach Key Concepts by asking what happens to unequal sharing of electrons in covalent bonds. Use Figure 4 to illustrate how nonpolar and polar bonds form.
- Lead a Discussion to reinforce that not all molecules containing polar bonds are entirely polar. Use Figure 5 to determine why carbon dioxide is not a polar molecule but water is classified as polar.
- Lead a Discussion about the differences between polar and nonpolar compounds' properties.
- Explore the Big Q by identifying the compounds in the Dead Sea to understand its properties. To Answer the Big Q, discuss how bonding can determine the properties of a substance.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – Bonding in Metals (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share ideas about what they know about the maglev trains.
- Then have students do the Inquiry Warm-Up activity. Students will investigate how different metals react to salt water. Discuss what happened to the nails and the bolt. The After the Inquiry Warm-Up worksheet sets up a discussion about how rust is formed. Have volunteers share their answers to question 4 about which object contains the most iron.

- Teach Key Concepts by explaining the term metal crystal. Then ask students to describe a metallic bond. Use Figure 1 to explain why metallic ions are described as embedded in a "sea" of electrons.
- Continue to Teach Key Concepts by explaining that the physical properties of metals can be explained by metallic bonding. Use Figure 2 to identify ways that metal is used.
- To Support the Big Q, explain how metallic bonding prevents the metal wire from breaking. Then have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 3 - Chemical Reactions

Lesson 1 – Observing Chemical Change (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share ideas about what types of chemistry they have noticed while cooking.
- Then have students do the Inquiry Warm-Up activity. Students will investigate a chemical reaction. Discuss their observations of vinegar and baking soda. The After the Inquiry Warm-Up worksheet sets up a discussion about the changes they observed during the chemical reaction. Have volunteers share their answers to question 4 about what happened to the temperature of the cup holding the mixture.
- Teach Key Concepts by reviewing some examples of physical and chemical properties of matter. Use Figure 1 to help students identify physical and chemical properties of a penny.
- Teach Key Concepts by asking students to describe how matter can be changed physically and chemically. Have students identify the physical and chemical changes to the apple in Figure 2.
- Review the definitions of physical change and chemical change before beginning the Apply It activity.
- To Support the Big Q illustrate how atoms can be rearranged during a reaction.
- Continue to Teach Key Concepts by explaining that during a chemical change there are physical and chemical property changes as well as changes in energy. Figure 3 shows evidence of chemical reactions, ask students to compare the new chemical and physical properties to the reactants properties. Also discuss any changes in energy that occurred.
- Lead a Discussion about clues that indicate a chemical reaction has taken place. Use Figure 4 to identify evidence that a chemical change has taken place and to identify other examples that also represent chemical changes.
- Lead a Discussion about endothermic and exothermic reactions.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Describing Chemical Reactions (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share ideas about how airbags work.
- Have them do the Inquiry Warm-Up activity. Students will model the law of conservation of mass. Discuss what the coins represent. The After the Inquiry Warm-Up worksheet sets up a discussion about the types and amount of coins before and after the reaction. Have volunteers share their answers to question 4 about information shown in a chemical equation.
- Lead a Discussion about sharing scientific information easily. Use Figure 2 to discuss what the parts of a compound formula represent. Identify parts of a chemical formula to Teach the Key Concepts. Use Figure 3 to show the format of a chemical equation.
- Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by explaining the law of conservation of mass in relation to a chemical reaction.
- Lead a Discussion about the chemical bonds and the atoms during a chemical reaction.
- Lead a Discussion about open and closed systems in chemical reactions.
- Lead a Discussion about why a chemical equation shows the same number of atoms of each element on both sides of the equation. Use the models on pages 176 and 177 to illustrate how an equation is balanced by using coefficients.
- To Explore the Big Q, discuss how matter is conserved during a chemical reaction. Have students Answer the Big Q and share their responses.
- Teach Key Concepts by asking what happens during each of the three chemical reactions.
- Lead a Discussion about how the common meanings of synthesis, decomposition, and replacement help in understanding each type of reaction.
- Review definitions of the types of chemical reactions before the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Controlling Chemical Reactions (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share ideas about what they know about the Hindenburg airship.
- Then have students do the Inquiry Warm-Up activity. Students will explore how temperature affects the rate of a chemical reaction. Discuss their observations of vitamin C and iodine. The After the Inquiry Warm-Up worksheet sets up a discussion about what this activity tested. Have volunteers share their answers to question 4 about how a chemical reaction can be affected by temperature.
- Teach Key Concepts by discussing activation energy.
- Lead a Discussion to review the terms endothermic reaction and exothermic reaction. Use Figure 2 to examine the amount of energy before and after the reaction.
- Continue to Teach Key Concepts by explaining which four factors affect the rate of a reaction.
- Lead a Discussion about how surface area affects the rate of reaction.
- Lead a Discussion about how the rate of reaction is affected by temperature and concentration. Use Figure 4 to discuss the reaction between hydrogen peroxide and potassium iodide.
- To Support the Big Q, discuss how glow sticks obey the law of conservation of mass and then ask students what type of a chemical reaction takes place in a glow stick.
- Then have students practice the inquiry skill in the Apply It activity. Use Figure 5 to examine how a catalyst affects a chemical reaction then discuss how the graph could change if it were an endothermic reaction.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Unit Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s): MS-PS1-1 – Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.]

4.0	Students will be able to: • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	Students will be able to: • Develop models to describe the atomic composition of simple molecules and extended structures.
2.0	Students will be able to: • Recognize or recall specific vocabulary(for example, actual mass, atomic composition, atomic weight, extended structure, molecular arrangement, molecular level, molecule, simple molecules (Such as ammonia and methanol) and extended structures (such as chloride or diamonds) • Describe the individual components of the atomic composition of molecules.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): MSPS1-4 - Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

4.0	Students will be able to: • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	Students will be able to: • Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]
2.0	Students will be able to: • Recognize or recall specific vocabulary(for example , boiling point, chemical compound, chemical element, chemical energy, chemical reaction, concentration of reactants, density, flammability, food oxidation, property, reaction rate, rusting, solubility, substance, surface area of reactants.) • Describe signs or signals that indicate a chemical reaction. • Describe how a substance changes before and after a chemical reaction.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): MSPS1-5-Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]	
4.0	Students will be able to: • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	Students will be able to: • Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved (for example, apply the law of conservation of matter to create physical models or drawings that represent atoms before and after a chemical reaction).
2.0	Students will be able to: • Recognize or recall specific vocabulary (for example, atom, chemical reaction, conserve, law of conservation of matter, mass, molecule, property). * Describe the basic nature of a chemical reaction. * Describe the atomic structure of a molecule.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Standard(s): MSPS1-6 - Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.[Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.

4.0	Students will be able to: • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	Students will be able to: • Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. (for example, create a device whose substances chemically react, and modify the type and concentration of those substances to control the transfer of energy into the environment).
2.0	Students will be able to: • Recognize and recall specific vocabulary (for example, absorb, chemical compound, chemical element, chemical energy, chemical process, chemical reaction, concentration, concentration of reactants, device, energy, environment, release, substance, thermal energy, transfer of energy). • Describe chemical processes that release or absorb thermal energy.
1.0	With help, partial success at level 2.0 content and level 3.0 content:
0.0	Even with help, no success

Unit Modifications for Special Population Students	
Advanced Learners	Enrichment Worksheets and Scenario Investigations
Struggling Learners	Use L1 Differentiated Instruction Activities
English Language Learners	Use ELL Support Activities from lesson as needed.
Special Needs Learners	Follow IEP modifications and work with special education teacher to make modifications and use L1 Differentiated Instruction Activities.

Unit Title: Life Science

Unit Description: Students will be introduced to life science through five chapters of instruction. They will be exploring cells and microscopy in the first chapter (Chapter 4). Chapter 5 discusses cell processes like photosynthesis, cellular respiration, fermentation and cell division. In Chapter 6, students will learn about topics in genetics by looking at Mendel's experiments and describing how traits are inherited. Punnett squares will be used to explain the probability of organisms inheriting traits. Delving further into heredity in Chapter 7, students will explore the discovery of DNA, genotypes, the production of proteins, mutations, human inheritance, selective breeding and genetic engineering. Chapter 8 introduces the student to the processes of the human body. They will look at the organization of the body, the various systems and homeostasis. Our last life science chapter is chapter 9 where the students will explore systems like the nervous system and the endocrine system and how the body reacts to the information produced by these systems. In the last sections of Chapter 9, students will be learning about human reproduction and the systems and processes involved, finishing with pregnancy and birth.

Unit Duration: About 17 weeks

Desired Results

Standard(s):

Chapter 4: Introduction to Cells - MSLS1-1, MSLS1-2

Chapter 5: Cell Processes and Energy - MSLS1-6

Chapter 6: The Science of Heredity - MSLS3-2

Chapter 7: DNA: The Code of Life – MSLS3-1, MSLS4-5

Chapter 8: Introduction to the Human Body – MSLS1-3

Chapter 9: Controlling Body Processes – MSLS1-8

Indicators:

Chapter 4: LS1.A Structure and Function

Chapter 5: LS1.C Organization for Matter and Energy Flow in Organisms, PS3.D Energy in Chemical Processes and Everyday Life

Chapter 6: LS1.B Growth and Development of Organisms, LS3.A Inheritance of Traits, LS3.B Variation of Traits

Chapter 7: LS3.A Inheritance of Traits, LS3.B Variation of Traits

Chapter 8: LS1.A Structure and Function

Chapter 9: LS1.D Information Processing

Understandings:

Students will ……

- Gather and synthesize information to explain what cells are. (C4L1)
- Apply scientific principles to describe how scientists first observed cells and developed the cell theory. (C4L1)
- Construct an explanation for how microscopes produce magnified images. (C4L1)
- Develop and use a model to describe the functions of cell structures and organelles. (C4L2)
- Apply scientific principles to describe how cells are organized in many-celled organisms. (C4L2)
- Gather and synthesize information to define elements and compounds. (C4L3)
- Apply scientific principles to identify the main compounds that are important in cells. (C4L3)
- Apply scientific principles to describe how materials move into and out of cells. (C4L4)
- Gather and synthesize information to explain how living things get energy from the sun. (C5L1)
- Develop and use models to describe what happens during photosynthesis. (C5L1)
- Develop and use models to explain the events that occur during respiration. (C5L2)
- Gather and synthesize information to explain what happens during fermentation. (C5L2)
- Apply scientific principles to explain the functions of cell division. (C5L3)
- Develop and use models to explain the events that take place during the stages of mitosis. (C5L3)
- Evaluate Mendel's experimental design and describe the results of his experiments. (C6L1)
- Construct a scientific explanation based on evidence to describe the role of alleles in the inheritance of traits. (C6L1)

Essential Questions:

Chapter 4 – Introduction to Cells

- What are cells made of?

Chapter 5 – Cell processes and Energy

- How do living things get energy?

Chapter 6 – The Science of Heredity

- Why don't offspring always look like their parents?

Chapter 7 – DNA: The Code of Life

- What does DNA do?

Chapter 8 – Introduction to the Human Body

- How does your body work?

Chapter 9 – Controlling Body Processes

- What systems regulate and control body processes?

• Use mathematical representations to define probability and describe how it helps explain the results of genetic crosses. (C6L2) • Apply scientific principles to explain what is meant by phenotypes and genotype. • Construct a scientific explanation based on evidence to describe at least three complex patterns of inheritance. (C6L3) • Apply scientific principles to discuss how characteristics result from inheritance and environmental factors. (C6L3) • Apply scientific principles to describe the role chromosomes and genes play in inheritance. (C6L4) • Develop and use a model to identify the events that occur during meiosis and fertilization. (C6L4) • Develop and use a model to describe the structure of DNA. (C7L1) • Construct a scientific explanation to describe how DNA copies itself. (C7L1) • Develop and use a model to describe how a cell produces proteins. (C7L2) • Apply scientific principles to identify how mutations can affect an organism. (C7L3) • Develop and use models to explain how cancer is related to mutations and the cell cycle. (C7L3) • Apply scientific principles to identify some patterns of inheritance in humans. (C7L4) • Gather and synthesize information to describe the functions of the sex chromosomes. (C7L) • Gather and synthesize information to identify the levels of organization in the body. (C8L1) • Construct a scientific explanation based on evidence for how skeletal and muscular systems work together. (C8L2) • Analyze data to describe which body systems work together to gain and transport materials. (C8L2) • Gather and synthesize information about the body systems that control communication and regulations. (C8L2) • Gather and synthesize information to define homeostasis and explain how systems interact to maintain homeostasis. (C8L3) • Gather and synthesize information to identify the functions of the skeleton. (C8L4) • Develop and use models to explain the role that joints play on the body. ((C8L4) • Analyze data to describe the characteristics of bones and to explain how to keep bones healthy and strong. (C8L4) • Interpret and analyze data to identify the types of muscles found in the body. (C8L5) • Construct a scientific explanation based on evidence to describe how skeletal muscles work in pairs. (C8L5) • Develop and use models to describe the functions and structures of the skin. (C8L6)	

• Gather and synthesize information to identify the functions of the nervous system. (C9L1) • Construct a scientific explanation based on evidence to describe the parts of the nervous system and how each part functions. (C9L1) • Analyze data to describe how the senses work. (C9L1) • Gather and synthesize information to describe how the glands of the endocrine system control body processes. (C9L2) • Analyze data to explain how negative feedback controls hormone levels. (C9L2) • Gather and synthesize information to describe the structures and functions of the male and female reproductive system. (C9L3) • Develop and use models to sequence the events that occur during the menstrual cycle. (C9L3) • Gather and synthesize information to list the stages of human development that occur before birth. (C9L4) • Interpret and analyze data to explain how developing embryo is protected and nourished. (C9L4) • Construct a scientific explanation based on evidence to describe what happens during childbirth. (C9L4)	
Assessment Evidence	

Performance Tasks: (Expectation Activities)

- Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- Develop and use a model to describe the function of a cell as a whole and the ways parts of a cell contribute to its function.
- Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- Develop and use a model to describe why structural changes to genes(mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
- Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Other Evidence:

Lesson Quizzes, Chapter Tests, Labs

Performance Assessments*

Chapter 4

- The Cell Game (Scenario Investigation) or Design and Build a Microscope

Chapter 5

- Energy Boosters (STEM Activity) or Exhaling Carbon Dioxide

Chapter 6

- We All Have It, So It Must Be Dominant (Scenario Investigation) or Make the Right Call

Chapter 7

- The WWGP (Scenario Investigation) or How Are Genes on Sex Chromosomes Inherited?

Chapter 8

- Working Together Is the Key (Scenario Investigation) or A Look Beneath the Skin

Chapter 9

- Stay Calm if You Can (Scenario Investigation) or Ready or Not!

*Additional or alternate performance assessments may be used.

Benchmarks: To be determined.

Learning Plan

Learning Activities:

Chapter 4 - Introduction to Cells

Introduce Big Q and Show Untamed Science Video – Touring Hooke's Crib

Lesson 1 – Discovering Cells (3 class periods**)**

- Begin by reading My Planet Diary as a class.
- Students tell what they already know about microscopes.
- Students will do the Inquiry Warm-Up activity. Students will observe newspaper photographs and determine that each image is made up of tiny dots they cannot normally see. Complete the after the Inquiry Warm-Up worksheet which sets up a discussion about how a magnifying lens can help you see very small objects.
- Have volunteers share their answers to question 4, predicting what they could see with a more powerful magnifying lens.
- Teach Key Concepts by explaining that every living thing is built out of cells and every cell has to perform the same set of basic functions to survive and Teach Key Concepts by explaining the basis of the cell theory.
- Support the Big Q by discussing Hooke's observations of the walls of cells that are no longer living.
- Lead a Discussion about the history of the cell theory.
- Teach Key Concepts by explaining that light microscopes magnify cells by focusing reflected light through lenses, and electron microscopes use beams of electrons to get even better magnification.

- Lead a Discussion about convex lenses and then Lead a Discussion about changes in resolution using car headlights as an example
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Looking Inside Cells (4 class periods**)**

- Read My Planet Diary as a class. Have students discuss how stains make it easier to study the parts inside a cell.
- Have students do the Inquiry Warm-Up activity. Students will estimate how tall they are in cells. The After the Inquiry Warm-Up worksheet sets up a discussion about the size of a single-celled organism.
- Have volunteers share their answers to question 4, describing the differences between an amoeba cell and a human body cell.
- Teach Key Concepts by explaining that cells contain smaller structures that carry out specific functions inside the cell.
- Lead a Discussion about the structure and function of the nucleus of a cell.
- Explore the Big Q by using Figure 3 to discuss the specialized structures of plant and animal cells.
- Lead a Discussion about chloroplasts.
- Have students practice the inquiry skill in the Apply It activity.
- Answer the Big Q by leading a class discussion about what cells are made of.
- Teach Key Concepts by explaining that multicellular organisms like plants and animals organize specialized cells into tissues, organs, and organ systems to perform specific tasks.
- Lead a Discussion contrasting unicellular organisms with multicellular organisms.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Chemical Compounds in Cells (2 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss how the stored fat in the humps of camels has helped them survive.
- Have students do the Inquiry Warm-Up activity. Students will perform an experiment to find out which foods contain starch. The After the Inquiry Warm-Up worksheet sets up a discussion about foods that contain starch. Have volunteers share their answers to question 4, sharing their ideas for experiments that determine which foods contain fat.
- Teach Key Concepts by explaining that compounds are substances made of elements. Compounds can be broken down into the elements they are made of, but elements cannot be broken down into simpler substances.
- Teach Key Concepts by explaining that every cell must either make or absorb some compounds to survive.
- Lead a Discussion about the source of most of the carbohydrates people eat.
- Lead a Discussion explaining that all the tissues of the human body that can been seen and felt – hair, skin, muscle – as well as a large part of all cell membranes are built out of proteins.
- Support the Big Q by reviewing the importance of proteins and lipids to the health of cells.
- Lead a Discussion about chromatin and DNA.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – The Cell in Its Environment (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss smells they notice even if they can't see the source.
- Have students do the Inquiry Warm-Up activity. Students will determine how long it takes for a drop of dye to spread through a container of water. The After the Inquiry Warm-Up worksheet sets up a discussion about how molecules spread from one point.
- Have volunteers share their answers to question 4 about whether food coloring would spread faster or slower in ice water than in room temperature water.
- Teach Key Concepts by explaining that the cell membrane determines which materials can enter a cell.
- Lead a Discussion about diffusion in cells.
- Lead a Discussion about osmosis and human skin.
- Have students practice the inquiry skill in the Apply It activity.
- Then Lead a Discussion about the process of facilitated diffusion.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 5 - Cell Processes and Energy

Introduce Big Q and Show Untamed Science Video – Ymm... Eating Solar Energy

Lesson 1 – Photosynthesis (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss where wild plants get the minerals they need to grow.
- Have students do the Inquiry Warm-Up activity. Students will determine the source of energy that powers a solar-powered calculator. The After the Inquiry Warm-Up worksheet sets up a discussion about type of energy used to power a solar-powered calculator. Have volunteers share their answers to question 4, explaining why they think some solar-powered calculators also have batteries.
- Support the Big Q by discussing some of the ways animals use energy and the source of their energy.
- Lead a Discussion about the sunlight needs of houseplants.
- Teach Key Concepts by explaining that almost all living things obtain energy either directly or indirectly from photosynthesis, the process by which a cell captures the energy in sunlight and uses it to make food.
- Lead a Discussion contrasting producers and consumers. Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by explaining that plants and some other organisms are able to carry out photosynthesis using the energy of the sunlight to combine water and carbon dioxide to produce sugars and oxygen.
- Lead a Discussion reviewing organelles and identifying the organelle found in plant cells but not in animal cells: chloroplast.
- Lead a Discussion about the first stage of photosynthesis. Continue to Lead a Discussion about the second stage of photosynthesis. Finally, Lead a Discussion about the chemical equation for photosynthesis.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Cellular Respiration (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss why scientists study extremophiles.
- Have students do the Inquiry Warm-Up activity. Students will observe the activities of yeast and determine one of the products of respiration. The After the Inquiry Warm-Up worksheet sets up a discussion about the products of respiration. Have volunteers share their answers to question 4 about how the presence of sugar affected the results of the experiment.
- Teach Key Concepts by explaining the process of cellular respiration.
- Lead a Discussion about the events that occur during respiration.
- Teach Key Concepts by explaining the process of fermentation and the conditions under which it occurs.
- Lead a Discussion about oxygen debt using the example of the buildup of lactic acid in muscles during short, intense exercise.
- Have students practice the inquiry skill in the Apply It activity.
- Explore the Big Q by helping students understand that while only producers carry out photosynthesis, both producers and consumers carry out cellular respiration.
- Answer the Big Q by leading a class discussion about the ways that living things get energy.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Cell Division (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss why the growth and reproduction of a cell is a cycle.
- Then have students do the Inquiry Warm-Up activity. Students will observe the activity of yeast cells under a microscope. The After the Inquiry Warm-Up worksheet sets up a discussion about the process of cell division that occurs in all living organisms. Have volunteers share their answers to question 4, giving their ideas for another hypothesis and explaining what the “double cells” may be undergoing.
- Explain that while cell division allows organisms to grow, it also allows them to repair damaged structures and reproduce.
- Explain that the cell cycle is the regular sequence of growth and division that cells undergo.
- Lead a Discussion about the events in interphase, the first stage of the cell cycle.
- Then Lead a Discussion about the second stage of the cell cycle: mitosis.
- Have students practice the inquiry skill in the Apply It activity.
- Lead a Discussion about what happens during cytokinesis.
- Support the Big Q by explaining that energy is required for cell division and that energy is produced during cellular respiration.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 6 - Genetics: The Science of Heredity

Introduce Big Q and Show Untamed Science Video – Where'd You Get Those Genes?

Lesson 1 – What is Heredity? (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about how something important can be forgotten and rediscovered.
- Have students do the Inquiry Warm-Up activity. Students will investigate what a kitten's unknown father looks like. Discuss the evidence you have about the mother's appearance and the kitten's appearance. The After the Inquiry Warm-Up worksheet sets up a discussion about the likely appearance of the father based on the evidence. Have volunteers share their answers to question 4 about whom the orange and black kittens might look like.
- Lead a Discussion about why some family members look very similar while others look very different.
- Use Figure 1 to illustrate how Mendel manipulated the cross-pollination of pea plants in his studies.
- Lead a Discussion about how Mendel's work helped people understand that purebred organisms have the same form of trait as their parents.
- Teach Key Concepts by explaining what happened when Mendel crossed purebred plants that differed in one trait.
- Lead a Discussion about why Mendel chose to use words derived from the Latin language to classify the generations.
- Continue to Teach Key Concepts by explaining that an organism's traits are controlled by the alleles it inherits from its parents.
- Have students look at Figure 3 to identify the two distinct forms for each trait Mendel studied.
- Use Figure 4 to show students how symbols are used to denote recessive and dominant alleles.
- Use the Support the Big Q to illustrate the idea that no trait gets lost or modified as it is passed from generation to generation.
- Then have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Probability and Heredity (4 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about why it is important for weather forecasters to use data and past experiences to predict the weather.
- Have students do the Inquiry Warm-Up activity. Students will investigate the role of probability in coin tossing. Discuss how many times your coin landed heads up and heads down. The After the Inquiry Warm-Up worksheet sets up a discussion about the probability of a cube landing on a specific side. Have volunteers share their answers to question 4 about which side the coin is more likely to land on after a second toss.
- Teach Key Concepts by explaining the term probability and asking students if probability predicts what will definitely happen.
- Continue to Teach Key Concepts by showing students a tool that helps predict the results of a genetic cross. Use Figure 1 to illustrate how to use the alleles of the purple and white purebred pea plants in a Punnett square to determine the color of the offspring.
- Teach Key Concepts by explaining how organisms can be described by their genotype or phenotype
- Use the Support the Big Q to illustrate when a trait is homozygous recessive, homozygous dominant, or heterozygous. Use Figure 2 to model how to list the genotypes and phenotypes for smooth pea pods and pinched pods.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Patterns of Inheritance (3 class periods**)**

- Begin by reading My Planet Diary as a class.
- Have students share ideas about whether or not the offspring of a red-eared slider turtle is decided based on probability.
- Have students do the Inquiry Warm-Up activity. Students will examine the natural characteristics of their classmates' hair. Discuss why it is important to only analyze the natural characteristics of hair. The After the Inquiry Warm-Up worksheet sets up a discussion about the presence of dominant and recessive alleles. Have volunteers share their answers to question 4 about how many attached earlobe alleles the woman has.

- Teach Key Concepts by explaining the two patterns of inheritance known as incomplete dominance and codominance. In Figure 1 have students identify which organism shows incomplete dominance and which organism shows codominance.
- Lead a Discussion about the idea that an organism can only inherit two alleles even if there are more possible alleles. However, this means that more genotypes can occur than with only two alleles.
- Lead a Discussion about how in polygenic inheritance more than one gene affects a trait. Then have students practice the inquiry skill in the Apply It activity
- Lead a Discussion about how acquired traits are different from inherited traits.
- Teach Key Concepts by asking students what factors can influence the way genes are expressed.
- Lead a Discussion about how genes and the environment interact.
- Explore the Big Q by discussing patterns of inheritance shown in Figure 3. To Answer the Big Q, discuss why offspring do not always look like their parents.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – Chromosomes and Inheritance (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about what they know about how chromosomes are related to diseases.
- Have students do the Inquiry Warm-Up activity. Students will investigate how chromosomes recombine through meiosis and fertilization. Discuss what color pods the female plant parents have. The After the Inquiry Warm-Up worksheet sets up a discussion of heredity and the color of seed pods. Have volunteers share their answers to question 4 about what color pods the next three offspring will have.
- Lead a Discussion about how discoveries can occur independently of one another rather than leading to one since they are not always initially connected.
- Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by explaining how genes are passed from parents to offspring. Use Figure 1 to explain what Sutton discovered about the relationship between the number of chromosomes in grasshopper sex cells compared to the number in body cells.
- To Support the Big Q, use Figure 2, and have students tell whether the pairs of alleles are homozygous or heterozygous.
- Teach Key Concepts by explaining what happens during meiosis. Use Figure 3 to describe the parts of a chromosome. Distribute the Key Concept Summaries as a review of each part of the lesson.

Chapter 7 - DNA: The Code of Life

Introduce Big Q and Show Untamed Science Video – Why Is This Lobster Blue?

Lesson 1 – The Genetic Code (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about female scientists who have made important contributions to science.
- Then have students do the Inquiry Warm-Up activity. Students will investigate a code and the uses for it. Discuss the characters in Morse code. The After the Inquiry Warm-Up worksheet sets up a discussion about the importance of knowing most of the characters in Morse code. Have volunteers share their answers to question 4 about whether you could decode and read the message if you were missing 10 or more letters in the Morse code table.
- Teach Key Concepts by explaining the terms helix and double helix.
- Show students the models of genetic structures shown in Figure 1. Identify the cell, nucleus, and chromosomes in Figure 1 as students sequence the images from largest to smallest.
- Teach Key Concepts by explaining the relationship among chromosomes, genes, and DNA.
- Have students practice the inquiry skill in the Apply It activity.
- Use the Support the Big Q to illustrate how the type of protein that will be produced is determined,
- Teach Key Concepts by explaining what happens during DNA replication. Use Figure 4 to illustrate the steps in DNA replication.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – How Cells Make Proteins (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about what makes scientists think that chickens and dinosaurs may be related.

- Have students do the Inquiry Warm-Up activity. Students will investigate RNA and DNA using models. Discuss what the chenille sticks in the DNA model represent. The After the Inquiry Warm-Up worksheet sets up a discussion about the similarities and differences between RNA and DNA. Have volunteers share their answers to question 4 about what the lines on the models of RNA and DNA represent.
- Teach Key Concepts by explaining that cells make proteins according to the codes in the genes.
- Have students practice the inquiry skill in the Apply It activity.
- Use the Explore the Big Q to illustrate the process of protein synthesis. Answer the Big Q by leading a class discussion about what DNA does.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Mutations (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about how being lactose intolerant can affect a person.
- Have students do the Inquiry Warm-Up activity. Students will explore what happens when a base from a strand of DNA is deleted or substituted. Discuss how many different nitrogen bases make up DNA. The After the Inquiry Warm-Up worksheet sets up a discussion about how the location of a deleted letter can cause a problem. Have volunteers share their answers to question 4 about which is likely to cause more damage, the deletion of one DNA base or the substitution of one DNA base for another.
- Teach Key Concepts by explaining that mutations can cause a cell to produce an incorrect protein during protein synthesis, which in turn can change an organism's trait.
- Use the Support the Big Q to illustrate the types of mutations and to identify which type causes the smallest change in the produced protein.
- Lead a Discussion about how cancer cells can damage the parts of the body by growing and dividing uncontrollably.
- Teach Key Concepts by explaining how cancer begins, how a tumor is formed, and how cancer spreads. Lead a Discussion about the various treatments used for cancer. Review how chemotherapy is used, then have students do the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – Human Inheritance (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss the ways that people resemble their relatives.
- Have students do the Inquiry Warm-Up activity. Students will measure the height of classmates and make a graph of the data. The After the Inquiry Warm-up worksheet sets up a discussion about human height and inherited traits. Have volunteers share their answers to question 4.
- Teach Key Concepts by explaining that some human traits are controlled by single genes with two alleles, others by single genes with multiple alleles, and others by many genes that act together.
- Lead a Discussion about blood types, a trait that is controlled by three alleles. Have students practice the inquiry skill in the Apply It /activity.
- Lead a discussion about the patterns of human inheritance.
- Teach Key concepts by explaining that sex chromosomes carry the genes that determine whether a person is male or female.
- Support the Big Idea by presenting a hypothetical example exploring sex=linked genes.
- Hand out Key Concepts Summaries as a review of each part of the lesson.

Lesson 5 – Advances in Genetics (2 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss zebra hybrids.
- Have students do the Inquiry Warm-Up activity. Students will examine the fingerprints of their classmates. The After the Inquiry Warm-Up worksheet sets up a discussion about the uniqueness of fingerprints. Have volunteers share their answers to question 4 about how to identify the owner of the unlabeled fingerprint.
- Teach Key Concepts by explaining the three ways to produce living things that have traits that are desired: selective breeding of parent organisms, cloning a single organism, and genetically altering an organism by transferring DNA from another organism. Lead a Discussion about the many varieties of cat and dog breeds that are the result of selective breeding.
- Lead a Discussion about two techniques of selective breeding: inbreeding and hybridization. Have students practice the inquiry skill in the Apply It activity.
- Lead a Discussion about cloning.
- Lead a Discussion about genetic engineering and some of its practical applications.
- Lead a Discussion about genetic engineering in bacteria and its advantages over selective breeding.
- Support the Big Q by discussing the uses of genetic engineering in cows and in some crop plants.

- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 8 - Introduction to the Human Body

Introduce Big Q and Show Untamed Science Video – Keeping Cool and Staying Warm

Lesson 1 – Body Organization (2 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about how important a medical illustrator's work is.
- Have students do the Inquiry Warm-Up activity. Students will investigate the organization of cells, tissues, and organs. Discuss what the smallest pieces of the model represent. The After the Inquiry Warm-Up worksheet sets up a discussion about the tissues within the body. Have volunteers share their answers to question 4, sequencing the least to most complex structures within the body.
- Teach Key Concepts by comparing the five levels of organization in the body to how a town is organized and operated.
- Lead a Discussion about the three parts of a cell and their functions.
- Use the Support the Big Q to illustrate the functions of the four different types of tissues.
- Lead a Discussion about the make-up and functions of organs.
- Have students practice the inquiry skill in the Apply It activity.
- To Support the Big Q, discuss how major functions in the body are carried out by organ systems composed of organs. Point out the different body systems seen in Figure 4 and discuss the structures and functions of the systems.
- Hand out the Key Concept Summaries as a review of each part of the lesson.
- Have students take the Lesson Quiz or an alternate assessment.

Lesson 2 – System Interactions (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about hearing colors or tasting shapes.
- Then have students do the Inquiry Warm-Up activity. Students will see how their bodies work together. Discuss how their arms felt after holding the books. The After the Inquiry Warm-Up worksheet sets up a discussion about the amount of work your body and arms do based on how the books are held. Have volunteers share their answers to question 4 about how your body is doing work when there are books on top of your head.
- Teach Key Concepts by explaining how the skeletal, muscular, and nervous systems work to make the body move. Use Figure 1 to illustrate that skeletal muscles contract or relax pulling on the bones to which they are attached.
- Lead a Discussion about the importance of joints especially in hands and feet.
- Lead a Discussion about how muscles work in pairs causing bones to move at their joints.
- Before beginning the Apply It activity, have students think about places in the body where movement takes place.
- Teach Key Concepts by explaining which systems move materials in the body.
- Use the Support the Big Q to identify the systems that help the body break down food into nutrient molecules.
- Use the human body illustrations to discuss what structures make up the circulatory, respiratory, digestive, and excretory systems.
- Teach Key Concepts by explaining how the nervous system and the endocrine system work to control body functions.
- Use the human body illustrations to see which structures make up the nervous and endocrine system.
- Review the functions of all the systems that work together to allow the body to function before assigning the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.
- Have students take the Lesson Quiz or an alternate assessment.

Lesson 3 – Homeostasis (2 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about how they manage stressful situations or times.
- Have students do the Inquiry Warm-Up activity. Students will observe how to make an unbalanced object balanced. Discuss why one end of the half-meter stick fell toward the ground. The After the Inquiry Warm-Up worksheet sets up a discussion about what is necessary to balance the half-meter stick. Have volunteers share their answers to question 4 about why it is important for the human body to be in balance.

- Teach Key Concepts by explaining that in homeostasis the organ systems work together to keep conditions inside the body balanced.
- Lead a Discussion about how body systems work together to regulate body temperature.
- Lead a Discussion about stress and how the body responds to it. Use the images in Figure 4 to discuss how some events can be stressful to some but may not be stressful to others.
- Use the Support the Big Q to illustrate how the immune system fights off bacteria and viruses that invade the body and disrupt homeostasis.
- Have students practice the inquiry skill in the Apply It activity. Use Figure 5 to show how the body systems of this runner work together as she pushes herself to excel. Explore the Big Q by examining how all the systems function in the runner's actions to make her body work. Have students Answer the Big Q and then ask them to share their responses.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – The Skeletal System (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about what they know about the bones in their bodies.
- Have students do the Inquiry Warm-Up activity. Students will compare the characteristics of rock and bone. Discuss the weight of bones in comparison to the weight of rocks. The After the Inquiry Warm-Up worksheet sets up a discussion about the durability of rock and bone. Have volunteers share their answers to question 4 about whether the same elements make up rocks and bones.
- Teach Key Concepts by explaining the five major functions of the skeleton.
- Lead a Discussion about the characteristics of bones.
- Use the Support the Big Q to illustrate the function of various bone structures.
- Lead a Discussion about minerals stored in the bones and the cells produced in some bones.
- Teach Key Concepts by explaining that some joints are immovable while others are movable. Use Figure 3 to identify the types of movements allowed by various joints.
- Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by asking students to refer to Figure 4 to understand that bones are living structures.
- Lead a Discussion about the structural characteristics of bones.
- Lead a Discussion again about habits that create strong, healthy bones.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 5 – The Muscular System (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about what they know about injured muscles.
- Have students do the Inquiry Warm-Up activity. Students will investigate how muscles work. Discuss why they thought a specific hand was stronger than the other. The After the Inquiry Warm-Up worksheet sets up a discussion about how muscles get stronger. Have volunteers share their answers to question 4 about testing the strength of the muscles in each leg.
- Lead a Discussion about how the muscles in students' arms moved and what they felt when they lifted the books.
- Teach Key Concepts by explaining similarities and differences between cardiac, skeletal, and smooth muscles. Use Figure 2 to identify where different types of muscles are located in the body.
- Use the Support the Big Q to illustrate that bones and muscles are not directly connected to one another but are attached by tendons.
- Teach Key Concepts by explaining what happens to skeletal muscles as they contract and relax.
- Lead a Discussion about how students can keep their muscles healthy.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 6 – The Skin (2 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about why they might need to see a dermatologist.
- Have students do the Inquiry Warm-Up activity. Students will investigate the surface of the skin. Discuss why students think some parts of their hands have hair and others do not. The After the Inquiry Warm-Up worksheet sets up a discussion about conditions that might affect the skin on the hands. Have volunteers share their answers to question 4 about what happens when you apply lotion to your skin.
- Teach Key Concepts by explaining how the skin's two layers protect the body and regulate the body's temperature.

- Lead a Discussion about how the skin eliminates waste, gathers information about the environment, and produces vitamin D. Use the images in Figure 2 to show students how human being's skin relates to events or a set of conditions.
- Have students analyze the structures of the skin in Figure 3.
- Explore the Big Q to examine how bones, muscles, and skin all support and protect the body. Have a discussion about the functions of bones, muscles, and skin to Answer the Big Q.
- Teach Key Concepts asking students what three things they should do to keep their skin healthy.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 9 - Controlling Body Processes

Introduce Big Q and Show Untamed Science Video – Think Fast!

Lesson 1 – The Nervous System (4 class periods**)**

- Begin by reading My Planet Diary as a class. Have students share ideas about situations that caused a part of their body to "fall asleep."
- Have students do the Inquiry Warm-Up activity. Students will investigate the organs, movements, and processes involved in performing a simple task. Discuss the steps students wrote for picking up a penny. The After the Inquiry Warm-Up worksheet sets up a discussion about what else the body is doing while it is focused on picking up a penny. Have volunteers share their answers to question 4 about the differences between all the steps involved in picking up a penny and all the other things the body was doing at the same time.
- Teach Key Concepts by explaining that the nervous system receives information from inside and outside the body and directs how the body responds while also maintaining homeostasis.
- Lead a Discussion about how the nervous system allows people to react to their environment.
- Support the Big Q by identifying the stimulus and response in each given situation.
- Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by describing the structure of a neuron. Use Figure 2 to illustrate why the structure of the dendrite matches its function.
- Lead a Discussion about how nerve impulses move between sensory neurons, interneurons, and motor neurons.
- Teach Key Concepts by asking students what a synapse is and how it relates to nerve impulses.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – The Endocrine System (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss the causes of acne.
- Have students do the Inquiry Warm-Up activity. Students will play a game to model how the body uses nerve impulses as signals.
- The After the Inquiry Warm-Up worksheet sets up a discussion about how signals transmit information. Have volunteers share their answers to question 4 telling how the activity modeled what goes on in the human body when signals travel from one part to another.
- Teach Key Concepts by explaining that the endocrine system regulates short-term and long-term activities by sending chemicals throughout the body.
- Lead a Discussion explaining that the endocrine system regulates the body's activities by sending hormones through the body in the blood.
- Have students practice the inquiry skill in the Apply It activity.
- Support the Big Q by using Figure 1 to identify the glands that cause the body to change over a person's lifetime.
- Lead a Discussion about how the nervous and endocrine systems cooperate, not compete, to keep the body functioning normally.
- Teach Key Concepts by explaining that when the amount of a hormone in the blood reaches a certain level, the endocrine system sends signals that stop the release of that hormone.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – The Male and Female Reproductive Systems (3 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss in vitro fertilization.
- Have students do the Inquiry Warm-Up activity. Students will analyze, sketch, and label slides of egg cells and sperm cells. The After the Inquiry Warm-Up worksheet sets up a discussion about the differences between male and female reproductive cells. Have volunteers share their answers to question 4 telling which the human body produces more of, sperm cells or egg cells.

- Support the Big Q by explaining that life begins from a single-cell egg and that trillions of cells result from a single fertilized egg.
- Teach Key Concepts by explaining the structures of the male reproductive system.
- Lead a Discussion using Figure 3 to explain the structures though which sperm pass.
- Continue to Teach Key Concepts by explaining the structures of the female reproductive system.
- Teach Key Concepts by explaining what happens during a menstrual cycle.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4– Pregnancy and Birth (2 class periods**)**

- Begin by reading My Planet Diary as a class. Have students discuss why a woman should see an obstetrician when she is pregnant.
- Have students do the Inquiry Warm-Up activity. Students will model the rate of growth of a human fetus. The After the Inquiry Warm-Up worksheet sets up a discussion about the growth rate of the human fetus. Have volunteers share their answers to question 4 giving their interpretations of the data on the graphs showing a fetus's growth in length and mass.
- Teach Key Concepts by explaining the stages of the development of a fetus.
- Support the Big Q by helping students distinguish a zygote, an embryo, and a fetus.
- Teach Key Concepts by explaining that the membranes and structures that form in the uterus during pregnancy protect and nourish the developing baby.
- Teach Key Concepts by explaining the three stages in the birth of a baby: labor, delivery, and afterbirth.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Unit Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

Standard(s):
MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different number and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different number and types of cells.
2.0	**Students will be able to:** • Describe specific vocabulary including: cell, prokaryotic and eukaryotic cells, stimulus, homeostasis, reproduction, organism, lens, magnification, multicellular and unicellular • Identify all the 6 characteristics of all living things • State the Cell Theory
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):
MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
2.0	**Students will be able to:** • Describe specific vocabulary including: cell, cell wall, cell membrane, nucleus, nucleolus, ribosomes, rough and smooth endoplasmic reticulum, mitochondria, golgi body, cytoplasm, chloroplasts, vacuole, organelle, lysosome, • Describe the cell parts' structure and function • Identify each cell structure • Compare and contrast plant and animal cells • Describe osmosis
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
2.0	**Students will be able to:** • Describe specific vocabulary including: neuron, nerve impulse, nerve, synapse, central nervous system, peripheral nervous system and reflex. • Describe how each part of the nervous system works • Explain that the nervous system includes sense organs.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.

3.0	**Students will be able to:** • Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
2.0	**Students will be able to:** • Describe specific vocabulary including: cell, tissue, organ, organ system, homeostasis, stress, hormone. • Identify the levels of organization in the body. • Explain how systems work together. Ex. Skeletal system and muscular system. • Describe the systems responsible for moving materials throughout the body. • Synthesize information about the body systems that communicate and regulate body systems.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [**Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
2.0	**Students will be able to:** • Describe specific vocabulary including: food chain, food web, photosynthesis, autotroph, heterotroph, chlorophyll, cellular respiration, fermentation cell cycle, interphase, replication, chromosome, mitosis, cytokinesis • Explain how living things get energy from the sun. • Explain the events that occur during respiration. • Explain what happens during fermentation.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

2.0	**Students will be able to:** • Describe specific vocabulary including: neuron, nerve impulse, nerve, synapse, central nervous system, peripheral nervous system and reflex. • Describe how each part of the nervous system works • Explain that the nervous system includes sense organs.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):
MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
2.0	**Students will be able to:** • Describe specific vocabulary including: glucose, carbon dioxide, oxygen, energy, fermentation, cell cycle, interphase, replication, chromosome, mitosis, cytokinesis • Describe the raw materials and products of photosynthesis. • Describe the raw materials and products of cellular respiration.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s):
MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
[Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
2.0	**Students will be able to:** • Describe specific vocabulary including: protein, messenger RNA, transfer RNA, mutation, cancer, tumor • Explain how mutations can affect an organism. • Describe how a cell makes proteins.

1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [**Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
2.0	**Students will be able to:** • Describe specific vocabulary including: heredity, trait, genetics, fertilization, purebred, gene, allele, dominant allele, recessive allele, hybrid, probability, Punnett square, phenotype, genotype, homozygous, heterozygous, incomplete dominance, codominance, multiple alleles, polygenetic inheritance, genotype, phenotype, mitosis and meiosis. • Describe Mendel's experiments. • Describe the role of alleles in the inheritance of traits. • Explain the difference between asexual reproduction and sexual reproduction.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): **MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.** [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]	
4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
2.0	**Students will be able to:** • Describe specific vocabulary including: selective breeding, inbreeding, hybridization, clone, genetic engineering and gene therapy. • Describe ways of producing organisms with desired traits. • Explain the difference between selective breeding, cloning and genetic engineering.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**

0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Enrichment Worksheets and Scenario Investigations
Struggling Learners	Use L1 Differentiated Instruction Activities
English Language Learners	Use ELL Support Activities from lesson as needed.
Special Needs Learners	Follow IEP modifications and work with special education teacher to make modifications and use L1 Differentiated Instruction Activities.

Unit Title: Earth Science

Unit Description: In this unit students will be learning about Earth science by learning about rock formation to why we study the past. Students will begin learning about minerals and rocks. This will include the three main types of rocks and how they form. From there, students will learn about how are Earth is in constant motion because of the tectonic plates that it is composed of and how they move. Students will also be able to relate that movement to earthquakes in the their next chapter of study. Learning the processes that shape the surface of the Earth through erosion and deposition will also help make students aware of the changes that are constantly happening on their Earth. The Earth science unit will conclude with looking at Earth's past. This will include fossils and the dating of rocks, as well as radioactive dating. Students will then take a trip to the past and learn about the Earth's history through learning about the different eras that have occurred to get to where we are today.

Unit Duration: about 13 weeks

Desired Results

Standard(s):

Chapter 10 – Minerals and Rocks – MS-ESS2-1

Chapter 11 – Plate Tectonics – MS-ESS2-3

Chapter 12 – Earthquakes – MS-ESS3-2

Chapter 13 – Erosion and Deposition – MS-ESS2-2

Chapter 14 – A Trip Through Geologic Time – MS-ESS1-4

Indicators:

Chapter 10 – ESS2.A Earth's Materials and Systems

Chapter 11 – ESS1.C History of the Planet Earth, ESS2.B Plate Tectonics and Large Scale System Interactions

Chapter 12 – ESS3.B Natural Hazards

Chapter 13 – ESS2.A Earth's Materials and Systems, ESS2.C The Role of Water in Earth's Surface Processes

Chapter 14 – ESS1.C History of the Planet Earth

Understandings:	**Essential Questions:**
Students will …… Chapter 10	Chapter 10 – Minerals and Rocks • How do rocks form?

Lesson 1
- Define a mineral.
- Explain how minerals are identified.
- Explain how minerals form and where mineral resource are located.

Lesson 2
- List the characteristics used to identify rocks, and identify the three major groups of rocks.

Lesson 3
- Identify the characteristics used to identify igneous rocks.
- Describe ways in which igneous rocks are used.

Lesson 4
- Describe how sedimentary rocks form.
- List and describe the three major types of sedimentary rocks.
- Explain how sedimentary rocks are used.

Lesson 5
- Describe the conditions under which metamorphic rocks form, how geologists classify metamorphic rocks and how metamorphic rocks are used.

Lesson 6
- Describe the rock cycle.

Chapter 11

Lesson 1
- Analyze and interpret data in the distribution of fossils and rocks, continental shapes, and seafloor structures to explain Alfred Wegner's hypothesis about the movement of the continents.

Lesson 2
- Construct an explanation from evidence for the formation of mid-ocean ridges.
- Apply scientific principles to explain how sea-floor spreading affects the Earth's crust.
- Develop and use models to explain the existence of deep-ocean trenches and explain the process of subduction.

Lesson 3
- Construct an explanation based on evidence of geoscience processes to describe the theory of plate tectonics.

Chapter 12

Lesson 1
- Construct a scientific explanation based on evidence for how stress in the crust changes Earth's surface.
- Develop and use models to describe the three major types of faults.
- Uses graphical displays to compare and contrast the land features that result from plate movement.

Lesson 2
- Integrate qualitative and scientific technical information to describe how the energy of an earthquake travels through Earth.
- Apply scientific ideas to identify the scales used to measure the strength of an earthquake.
- Apply scientific principles to explain how scientists locate the epicenter of an earthquake.

Chapter 11 – Plate Tectonics
- How do moving plates change Earth's crust?

Chapter 12 – Earthquakes
- Why do earthquakes occur more often in some places than in others?

Chapter 13 – Erosion and Deposition
- What processes shape the surface of the land?

Chapter 14 – A Trip Through Geologic Time
- How do scientists study Earth's past?

Lesson 3 • Apply scientific principles to explain how seismographs work. • Analyze and interpret data to explain the patterns that seismographic data reveal. Chapter 13 Lesson 1 • Construct an explanation based on evidence for the geoscience processes that wear down and build up Earth's surface. • Apply scientific principles to identify the causes of different types of mass movements. Lesson 2 • Use graphical displays to explain how moving water causes erosion. • Construct an explanation based on evidence to describe some of the land features that are formed by water erosion and deposition. Lesson 3 • Gather and synthesize to explain how glaciers form and move. • Develop and use models to explain how glaciers cause erosion and deposition. Lesson 4 • Develop and use models to describe how ocean waves cause erosion and deposition. Lesson 5 • Interpret evidence to explain how wind causes erosion and deposition. Chapter 14 Lesson 1 • Explain how fossils form. • Identify the different kinds of fossils. • Describe what fossils tell about organisms and environments of the past. Lesson 2 • Describe how geologists determine the relative age of rocks. • Explain how unconformities and folding can alter the order of rock layers. Lesson 3 • Explain what happens during radioactive decay. • Describe what can be learned from radioactive dating.. Lesson 4 • Construct a scientific explanation for how and why the geologic time scale is used to show Earth's history. Lesson 5 • Construct a scientific explanation based on evidence to explain how Earth developed during the Precambrian time. Lesson 6 • Construct a scientific explanation based on evidence for major events in the Paleozoic Era. • Construct a scientific explanation based on evidence for major events in the Mesozoic Era.	

- Construct a scientific explanation based on evidence for major events in the Cenozoic Era.

Assessment Evidence

Performance Tasks: (Expectation Activities)

- Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motion.
- Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their efforts.
- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- 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.

Other Evidence:

- Lesson quizzes
- Chapter Tests
- Performance Assessments

Chapter 10

- Test Rock Flooring Lab
- The Rock Cycle Virtual Lab

Chapter 11

- Modeling Sea-Floor Spreading Lab
- Rate of Continental Drift Virtual Lab

Chapter 12

- Finding the Epicenter Lab
- Locating an Earthquake Virtual Lab

Chapter 13

- Quick Labs
- Sand Hills Lab

Chapter 14

- Exploring Geologic Time Through Core Samples Lab
- Radiometric Dating Virtual Lab

Benchmarks: to be determined

Learning Plan

Learning Activities
Chapter 10 - Minerals and Rocks
Lesson 1 – Properties of Minerals (4-5 class periods)

- Begin by reading My Planet Diary. Have students share how stalactites and stalagmites form. Then have students do the Inquiry Warm-up Activity. Students will grow and compare crystals. The After the Inquiry Warm-up Worksheet sets up a discussion about the formation of crystals. Have volunteers share their answers to number 4 about how the rate of cooling affects crystal formation.
- Teach Key Concepts by reviewing the term inorganic. Explain that minerals have five characteristics: they occur naturally, are solid, have a crystal structure, can form by inorganic processes, and have a chemical composition. Lead a discussion about the structure of minerals.
- Continue to Teach Key Concepts by explaining that minerals can be sorted and identified by their physical properties, such as color, streak, hardness, luster, density, and crystal structure. Use Figure 6 to explain the Mohs Hardness Scale. Lead a discussion about how the physical properties of mass and volume relate to density.
- Review the terms geode and crystallization. Teach Key Concepts by explain the main ways minerals form: organic process, crystallizing from materials dissolved in solutions, crystallizing as magma and lava cools, and

sometimes minerals form from a solution. Lead a discussion about organic mineral formation using an ocean animal shell. Then lead a discussion about the ways minerals crystallize from a solution. Teach Key Concepts by explaining that minerals form when magma and lava cool. Use Figure 12 to Support the Big Q about the characteristics of minerals in volcanic rock.

- Hand out the Key Concept Summaries as a review of the lesson.

Lesson 2 – Classifying Rocks (1-2 class periods)

- Begin by reading My Planet Diary as a class. Have students identify the three main groups of rocks. Then have students do Inquiry Warm-Up activity. Students will observe and compare rock characteristics. The After the Inquiry Warm-up worksheet sets up a discussion about comparing rocks using color, texture, hardness, and density. Have volunteers share their answers to number 4 about using the characteristics of rocks for a specific use.
- Teach Key Concepts by explaining that a grain, in geology, means a particle of rock. Explain that geologists can identify a rock by looking at its composition. Continue to Teach Key Concepts by explaining the three main groups of rock: igneous, sedimentary, and metamorphic.
- Support the Big Q by discussing how each of the three types of rock form.
- Lead a Discussion about how scientists describe a rock's texture.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Igneous Rocks (1-2 class period)

- Begin by reading My Planet Diary as a class. Have students discuss how the geologists found a source for diamonds. Then have students do the Inquiry Warm-Up activity. Students will model the difference between rocks formed from slow-cooling magma and fast-cooling lava. The After the inquiry Warm-Up worksheet asks students to draw conclusions about how the rate at which magma cools affects the grain size of the rock that is formed. Have volunteers share their answers to number 4, which makes a generalization about the grain size of a rock formed from lava and the grain size of rock from magma.
- Review the terms extrusive rock and intrusive rock. Teach Key Concepts by explaining that igneous rock is classified by origin, texture, and mineral composition.
- Use the Support the Big Q activity to help students understand that igneous rocks that cooled on Earth's surface have smaller grains than igneous rocks that cooled beneath the surface.
- Have students practice the inquiry skill in the Apply It activity.
- Continue to Teach Key Concepts by explaining that igneous rocks have been used throughout history for tools and building materials because they are hard and durable, and can be attractive.
- Lead a Discussion about volcanic glass and its uses.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – Sedimentary Rocks (2-3 class periods)

- Begin by reading My Planet Diary as a class. Have students discuss why chert was used to make arrowheads. Then have students do the Inquiry Warm-Up activity. Students will test sedimentary rock samples and draw conclusions about each rock's origin. The After the Inquiry Warm-up worksheet guides students to infer about the original processes that formed the rock samples. Have volunteers share the answer to number 4, in which they infer the classification of a rock sample by the processes that formed it.
- Teach Key Concepts using Figure 1 to explain each of the processes that forms sedimentary rock: weathering, erosion, deposition, compaction, and cementation.
- Continue to Teach Key Concepts using Figures 2 and 3 to explain the three major groups of sedimentary rocks: clastic, organic, and chemical. Use the Support the Big Q activity to review the steps in the formation of sedimentary rocks. Lead a Discussion about the three basic rock-forming processes geologists use to categorize sedimentary rocks. Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by explaining that sedimentary rocks have been used throughout history for tools and building materials. Lead a Discussion about today's common uses of sedimentary rocks and sedimentary rock sources in New Jersey.
- Hand out Key Concept Summaries as a review of each part of the lesson.

Lesson 5 – Metamorphic Rocks (1-2 class periods)

- Begin by reading My Planet Diary as a class. Have students discuss how heat can change a rock's form without melting it. Then have students do the Inquiry Warm-Up activity. Students will use sequins and clay to model how rock become foliated. The After the Inquiry Warm-Up worksheet sets up a discussion about how pressure can change rocks. Have volunteers share their answers to number 4 about real-world examples of metamorphic rock.

- Teach Key Concepts by explaining that foliated refers to the leaf-like flattening of grains into layers in some metamorphic rocks. Then use Figure 1 to explain that a metamorphic rock is formed by heat and pressure deep below the Earth's surface causing changes in the appearance, texture, and crystal structure of the rock.
- Support the Big Q by discussing the sources of heat for changing rock.
- Continue to Teach Key Concepts by explaining that geologists classify metamorphic rocks by how their grains are arranged. Discuss the uses of metamorphic rocks, such as using marble and slate for building materials and sculptures.
- Lead a Discussion to help students recognize the differences between foliated and nonfoliated rocks.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 6 – The Rock Cycle (1-2 class periods)

- Begin by reading My Planet Diary as a class. Encourage students to brainstorm a list of Earth processes that affect the Himalayas and other Earth rocks. Then have students do the Inquiry Warm-up activity. Students will use interconnecting plastic blocks to model the rock cycle. The After the Inquiry Warm-Up worksheet sets up a discussion about the characteristics of the new rocks. Have volunteers share their observations to number 4 about a pattern to the placement of the grains in the rock.
- Teach Key Concepts by explaining that the rock cycle is a slowly repeating process by which Earth's rocks are built, destroyed, and changed by forces in and on Earth.
- Lead a Discussion about the effects of the rock cycle and plate tectonics. Then Lead a Discussion explaining that rocks change form through the rock cycle.
- Explore the Big Q by helping students identify the products and the processes of the rock cycle shown in Figure 2.
- Do the Apply It activity and then have students Answer the Big Q to discuss rock formation.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 11 - Plate Tectonics

Lesson 1 – Drifting Continents (1-2 class periods)

- Begin by reading My Planet Diary. Have students identify other evidence that would show the continents had once been joined. Then have students do the Inquiry Warm-Up activity. Students will locate oceans and continents on a globe. The After the Inquiry Warm-Up worksheet sets up a discussion about how Earth's continents are connected. Have volunteers share their answers to number 4 about how islands might have formed.
- Teach Key Concepts by explaining that continental drift means the slow moving of the continents. Explain Wegner's hypothesis that all continents were once joined together in a supercontinent called Pangaea.
- Lead a Discussion about how pieces of a jigsaw puzzle fit together can be used to reconstruct Pangaea.
- Support the Big Q by explaining that while Wegner had a hypothesis, he had no way to explain how the continents had separated and moved away from each other.
- Use a current world map and Figure 2 to Lead a Discussion about how the continents could be assembled into one large landmass.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Sea-Floor Spreading (1-2 class periods)

- Begin by reading My Planet Diary as a class. Have students discuss how scientists can learn about something they can't see. Then have students do the Inquiry Warm-Up activity. Students will investigate density changes by moistening a washcloth with water and watching its edges start to sink. The After the Inquiry Warm-Up worksheet sets up a discussion about the difference between mass and density. Have volunteers share their answers to number 4 about items that sink or float depending on whether they are more dense and less dense than water.
- Teach Key Concepts by explaining that a mid-ocean ridge is a narrow, high landform near the middle of the ocean. Explain how scientists mapped mid-ocean ranges using sound waves.
- Lead a Discussion about how scientists have used information gained from measuring the length of time it takes for soar to send and receive sound waves to map the ocean floor.
- Continue to Teach Key Concepts by explaining the relationship between sea-floor spreading and continental drift. Use the Support the Big Q to help students understand that scientific theories must be testable and supported by evidence.

- Teach Key Concepts by using Figure 3 to explain that subduction is the process by which the ocean floor sinks beneath a deep-ocean trench and back into the mantle again. Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – The Theory of Plate Tectonics (2-3 class periods)

- Begin my reading My Planet Diary as a class. Have students discuss why the distance across the Atlantic Ocean will increase as time passes. Then have students do the Inquiry Warm-Up activity. Students will use modeling clay to model tectonic plate boundaries. The After the Inquiry Warm-Up worksheet sets up a discussion of how Earth's plates interact. Have volunteers share their answer to number 4 about the land features produced when plates collide.
- Teach Key Concepts by explaining that plate tectonics is the theory the Earth's plates are in slow, constant motion, driven by convection currents in the mantle.
- Lead a Discussion to help students form a definition of the plate as a broad, flat sheet of material. Remind students that Wegener proposed that 300 million years age Pangaea existed as a supercontinent.
- Lead a Discussion about the possible position of the continents 50 million years from today. Remind students that two adjacent plates can move toward each other, away from each other, and slip past each other. Then Lead a Discussion about the movement that occur at a divergent boundary, a convergent boundary, and a transform boundary.
- Have students practice the inquiry skill in the Do the Math activity. Explore the Big Q by discussing the ways in which Earth's crust is changed by plate motions.
- Hand out Key Concept Summaries as a review of each part of the lesson.

Chapter 12 - Earthquakes

Lesson 1 – Forces in the Earth's Crust (3-4 class periods)

- Begin by reading My Planet Diary as a class. Have students discuss example of changes in Earth's surface, such as erosion or mudslides. Then have students do the Inquiry Warm-Up activity. Students will explore the effect of a deforming force on an object. The After the Inquiry Warm-Up worksheet sets up a discussion about how force can affect matter. Have volunteers share their answers to number 4 about how the stored energy is released when force is applied.
- Teach Key Concepts by explaining that the forces acting on rock are applied constantly over a long time. Have students look at Figure 1 to see the three ways forces cause stress on rocks.
- Support the Big Q by discussing how stress in rock is released and what happens at please where rock under stress breaks.
- Continue to Teach Key Concepts using Figure 2 to show how faults occur. Then have students do the Apply It activity and share their results.
- Explain to students that forces in Earth's crust can also create mountains and other landforms. Continue to Teach Key Concepts by explaining the different ways a fault can change the level of the land surface. Review the terms tension, compression, and shearing and then Lead a Discussion about how over time rock movement changes Earth's crust.
- Review the difference between a normal fault and a reverse fault and then Lead a Discussion about how fault-block mountains can form from tension in Earth's crust.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Earthquakes and Seismic Waves (3-4 class periods)

- Begin by reading My Planet Diary as a class. Have students tell what they already know about earthquakes. Then have the students do the Inquiry Warm-Up activity. Students will model two kinds of waves that travel through a spring toy. The After the Inquiry Warm-Up worksheet sets up a discussion about how waves move through matter. Have volunteers share their answers to number 4 comparing the waves created with the spring toy and water waves.
- Teach Key Concepts by explaining that seismic waves travel through Earth carrying energy released by an earthquake.
- Support the Big Q by reviewing how plate movement leads to the formation of faults. Remind students that earthquake waves carry energy in many directions from the source.
- Have students practice the inquiry skill in the Apply It activity. Then use Figure 2 to Lead a Discussion about the types of seismic waves. Use Figure 2B to show how S waves vibrate.
- Continue to Teach Key Concepts by explaining the three scales used to measure earthquakes: the Modified Mercalli Scale, the Richter Scale, and the Moment Magnitude Scale.

- Then Lead a Discussion about the two ways to measure the seismic waves produced by earthquakes: the amount of damage and the magnitude.
- Teach Key Concepts by explaining that seismic waves travel out in all directions from the epicenter and can be detected in many places.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Monitoring Earthquakes (2-3 class periods)

- Begin by reading My Planet Diary as a class. Have students discuss why the USArray project started in the western United States. Then have students do the Inquiry Warm-Up activity. Students will model a device to detect waves moving through matter. The After the Inquiry Warm-Up worksheet sets up a discussion about how waves move through matter. Have volunteers share their answers to number 4 about why scientists must rely on instruments to detect earthquake waves.
- Teach Key Concepts by explaining that a seismograph produces a record of vibrations in Earth. Then use Figure 1 to explain how a seismograph works. Use Figure 2 to explain what the different lines on a seismograph indicate.
- Continue to Teach Key Concepts by explaining that scientists used data from seismographs to map where earthquakes often occur along plate boundaries.
- Lead a Discussion about the importance of developing ways to predict earthquakes. Have students practice the inquiry skill before beginning the Apply It activity.
- Explore the Big Q by using Figure 3 to identify countries with a history of earthquakes.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 13 - Erosion and Deposition

Lesson 1 – Mass Movement (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss the relationship between gravity and landslides and mudslides. Then have students do the Inquiry Warm-Up activity. Students will observe and compare the effect of gravity on a marble's movements on a surface with and without sandpaper covering. The After the Inquiry Warm-Up worksheet sets up a discussion about the factors that influence the effect gravity has on material on a slope. Have volunteers share their answers to question 4 identifying the factor that clearly influences the effect of gravity on materials on a slope.
- Review the terms erosion and deposition and then Teach Key Concepts by explaining the cycle of processes—weathering, erosion, and deposition—that build up and wear down the surface of Earth.
- Continue to Teach Key Concepts by explaining the four kinds of mass movement: landslides, mudflows, slump, and creep.
- Support the Big Q by discussing the effects erosion and deposition have on Earth's surface in the instance of a mass movement. Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – Water Erosion (3-4 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share their experiences with caves and prior knowledge of how they form. Then have students do the Inquiry Warm-Up activity. Students will use soap and dripping water to model erosion. The After the Inquiry Warm-Up worksheet sets up a discussion about how moving water wears away rocks. Have volunteers share their responses to question 4.
- Teach Key Concepts by explaining that water is an agent of erosion and responsible for shaping much of Earth's surface.
- Lead a Discussion about how water can pick up sediment at one place and deposit it at another, reshaping the surface of Earth.
- Lead a discussion about the sources of water in a major river in your county or state and how the river changes throughout the year.
- Teach Key Concepts by explaining how a flowing river forms valleys, waterfalls, flood plains, meanders, and oxbow lakes.
- Lead a discussion about how flood plains form as rivers spread out and erode the land.
- Continue to Teach Key Concepts by explaining how alluvial fans and deltas form as the flow of river water slows.
- Explore the Big Q by using Figure 7 to discuss how a river changes from its head to its mouth.
- Continue to Teach Key Concepts by explaining that groundwater erosion occurs as a result of chemical weathering.
- Lead a Discussion about the sequence of events that results in the formation of a cave. Have students practice the inquiry skill in the Apply It activity.

- To Answer the Big Q, lead a class discussion about the processes that shape the surface of the land.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Glacial Erosion (2-3 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss the differences between snow and glacial ice. Then have students do the Inquiry Warm-Up activity. Students will model glacial erosion by abrasion. The After the Inquiry Warm-Up worksheet sets up a discussion about how glaciers wear land away. Have volunteers share their answers to question 4 about what land under a glacier would look like after the glacier has melted.
- Review the term glacier and then Teach Key Concepts by explaining the two kinds of glaciers: continental and valley.
- Continue to Teach Key Concepts by explaining that glaciers can only form in places where more snow falls than melts.
- Have students practice the inquiry skill in the Apply It activity.
- Teach Key Concepts by explaining the two ways glaciers cause erosion of the land over which they move: plucking and abrasion.
- Continue to Teach Key Concepts by explaining that when a glacier melts, it deposits the sediment it eroded from the land, creating various landforms.
- Support the Big Q by discussing how glaciers are agents of both erosion and deposition and how these two processes shape the surface of the land.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – Wave Erosion (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students share their experiences with rough water and waves. Then have students do the Inquiry Warm-Up activity. Students will use a hand lens to observe beach sand and see what it is made up of. The After the Inquiry Warm-Up worksheet sets up a discussion about the origins of beach sand. Have volunteers share their answers to question 4 as to whether sand is a cause or an effect of erosion.
- Teach Key Concepts by explaining how ocean waves cause erosion by breaking down rock and picking up and moving sediment.
- Continue to Teach Key Concepts by explaining that ocean waves change coastlines through deposition, forming beaches, sandbars, barrier beaches, and spits.
- Lead a Discussion about the process of longshore drift.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 5 – Wind Erosion (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students to tell what they already know about sand dunes. Then have students do the Inquiry Warm-Up activity. Students will simulate wind erosion. The After the Inquiry Warm-Up worksheet sets up a discussion about how moving air effects sediment. Have volunteers share their answers to question 4 about the factors that determine how moving air affects sediments.
- Support the Big Q by leading a discussion about how wind erosion affects Earth's surface, explaining that deflation is the main process by which wind erosion occurs.
- Teach Key Concepts by explaining that the results of wind erosion and deposition include landforms called dunes and deposits called loess.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Chapter 14 - A Trip Through Geologic Time

Lesson 1 – Fossils (2-3 class periods)

- Begin by reading My Planet Diary as a class.
- Have students tell what they already know about fossils. Then have students do the Inquiry Warm-Up activity. Students will examine, draw, and describe a rock sample. The After the Inquiry Warm-Up worksheet sets up a discussion about the students' investigation of a rock sample and their ideas about how its parts got into the rock. Have volunteers share their labeled drawings of rocks.
- Teach Key Concepts by using Figure 1 to explain the three basic steps in the formation of a fossil.
- Continue to Teach Key Concepts by explaining the different kinds of fossils: molds and casts, petrified fossils, carbon films, and trace fossils.

- Support the Big Q by discussing that fossils are the remains of plants or animals and also physical evidence of the presence of organisms, such as tracks or burrows. Have students practice the inquiry skill in the Apply It activity.
- Continue to Teach Key Concepts by explaining how scientists use fossils to understand organisms from the past and the environments in which they lived.
- Lead a Discussion about extinct species.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 2 – The Relative Age of Rocks (2-3 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss how water carries away rock and soil particles. Then have students do the Inquiry Warm-Up activity. Students will use clay to create a model of rock layers. The After the Inquiry Warm-Up worksheet sets up a discussion about the positions of sediment layers. Have volunteers share their answers to question 4.
- Teach Key Concepts by explaining that geologists use the law of superposition to determine the relative ages of sedimentary rock layers.
- Continue to Teach Key Concepts by explaining that geologists can infer relative age by comparing two or more layers in which a certain index fossil occurs.
- Support the Big Q by using Figures 2 and 3 to discuss how intrusions and faults convey information about relative age.
- Have students practice the inquiry skill in the Apply It activity.
- Continue to Teach Key Concepts by explaining how erosion, folding, and motion along faults can affect Earth's geologic record.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 3 – Radioactive Dating (2-3 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss the discovery of radioactivity. Then have students do the Inquiry Warm-Up activity. Students will measure and cut pieces of clay to explore the concept of half-life. The After the Inquiry Warm-Up worksheet sets up a discussion about radioactive dating. Have volunteers share their answers to question 4 saying if it is possible to perform the action on a cube of any size.
- Explain the term radioactive and then Teach Key Concepts by explaining that during the decay process atoms of the decaying element break down to form atoms of a different element and particles and energy are released.
- Continue to Teach Key Concepts by explaining how radioactive elements are used in the absolute dating of rocks and fossils.
- Lead a Discussion about atoms to be certain students have the background they need to understand the concept of radioactive dating.
- Support the Big Q by explaining that while carbon-14 is a radioactive isotope of carbon, not all isotopes of carbon are radioactive, reviewing the concept of isotopes, if necessary.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 4 – The Geologic Time Scale (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss the table showing Earth's history in a day. Then have students do the Inquiry Warm-Up activity. Students will create a timeline of their own lives. The After the Inquiry Warm-Up worksheet sets up a discussion of how to make a model of a geologic time scale. Have volunteers share the timelines they created in response to question 4.
- Teach Key Concepts by explaining that scientists use the geologic time scale as an organizational tool to make it easier to communicate information about Earth's history.
- Support the Big Q by identifying the major changes in the fossil record that mark the beginning and end of each time unit on the geologic time scale.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 5 – Early Earth (1-2 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss the table showing Earth's history in a day. Then have students do the Inquiry Warm-Up activity. Students will create a timeline of their own lives. The After the Inquiry Warm-Up worksheet sets up a discussion of how to make a model of a geologic time scale. Have volunteers share the timelines they created in response to question 4.
- Teach Key Concepts by explaining that scientists use the geologic time scale as an organizational tool to make it easier to communicate information about Earth's history.

- Support the Big Q by identifying the major changes in the fossil record that mark the beginning and end of each time unit on the geologic time scale.
- Have students practice the inquiry skill in the Apply It activity.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Lesson 6 – Eras of Earth's History (4-5 class periods)

- Begin by reading My Planet Diary as a class.
- Have students discuss the questions they have about the history of life on Earth. Then have students do the Inquiry Warm-Up activity. Students will determine criteria for constructing and dividing a time scale. The After the Inquiry Warm-Up worksheet sets up a discussion about timelines. Have volunteers share their answers to question 4 about which is the better tool for presenting a person's history: a timeline or a list of key events.
- Teach Key Concepts by explaining the dramatic changes in life forms that occurred at the beginning of the Paleozoic Era.
- Continue to Teach Key Concepts by discussing the dramatic change in life forms that occurred during the Devonian Period.
- Lead a Discussion about the major events during the Paleozoic Era.
- Continue to Teach Key Concepts by telling students about two major events during the Permian Period: the mass extinction and the formation of the supercontinent.
- Teach Key Concepts by explaining why the Triassic Period of the Mesozoic Era is also known as the Age of Reptiles.
- Have students practice the inquiry skill in the Apply It activity.
- Continue to Teach Key Concepts by explaining that Earth's geologic history is divided into eras and periods according to large, dramatic events or changes in life forms that occurred.
- Teach Key Concepts by discussing the three periods of the Cenozoic Era.
- Explore the Big Q using Figure 6 to discuss the landmark events and life forms in each era.
- Hand out the Key Concept Summaries as a review of each part of the lesson.

Unit Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

Standard(s):
MS-ESS2-1 Earth's Place in the Universe Students who demonstrate understanding can:
MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

4.0	**Students will be able to:** • In addition to 3.0 performance, the student demonstrates in-depth interferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process (for example, create an use a model to explain the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials).
2.0	**Students will be able to:** • Recognize to recall specific vocabulary (for example, crystal, crystallization, cycle, deformation, Earth material, energy, flow, formation, melt, mineral, recrystallization, sedimentation, weathering). • Describe the role of melting, crystallization, weathering, deformation, and sedimentation in the formation of rocks and minerals.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, continent, continental shape, continental shelf, distribution, Earth's crust, fossil, fracture zone, geologic force, geologic shift, lithosphere, motion, plate, ridge, rock layer movement, seafloor structure, trench). • Describe ways in which the Earth's surface has changed over time. • Describe how distribution of fossils, rocks, continental shapes, and seafloor structures give evidence of past plate motion.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS-ESS 3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: Catastrophic, Drought, Earthquake, Flood, Forecast Frequency, Hurricane, Location, Mitigate, Natural Hazard, Predict, Reservoir, Satellite, Severe Weather, Technology, Tornado, Tsunami, Volcanic Eruption • Describe natural hazards. • Describe indicators that a natural hazard may occur. • Describe technologies that can mitigate the effects of natural hazards.

1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales (for example, use evidence to explain how geoscience processes such as surface weathering and deposition by the movements of water, ice, and wind – especially geoscience processes that shape local geographic features – change Earth's surface at time and spatial scales that can be large, such as slow plate motions or the uplift of large mountain ranges, or small, such as rapid landslides or microscopic geochemical reactions, and how many geoscience processes usually behave gradually but are punctuated by catastrophic events, such as earthquakes, volcanoes, and meteor impacts).
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, catastrophic, depositions, Earth's layers, Earth's surface, earthquake, geochemical reaction, geographic feature, feoscience, igneous rock, landslide, metamorphic rock, meteor impact, microscopic, mountain range, plate motion, sediment deposition, sedimentary rock, sedimentation, spatial scale, surface, surface runoff, time scale, uplift, volcano, water cycle, weathering). • Describe how long it takes for various geoscience processes to change the Earth's surface (for example, weathering, deposition, plate motion, uplift, landslides, earthquakes, volcanoes, and meteors).
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): MS-ESS1-4. 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. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • 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. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to

	establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, Earth's age, evidence, evolution, extinction, formation, fossil, geologic, geologic evidence, history, Homo sapiens, Ice Age, living organism, mountain chain, ocean basin, relative, rock formation, rock layer movement, rock strata, sedimentary rock, time scale, volcanic eruption).
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students

Advanced Learners	Enrichment Worksheets and Scenario Investigations
Struggling Learners	Use L1 Differentiated Instruction Activities
English Language Learners	Use ELL Support Activities from lesson as needed. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Special Needs Learners	Follow IEP modifications and work with special education teacher to make modifications and use L1 Differentiated Instruction Activities. http://www.nj.gov/education/udl/

Interdisciplinary Connections

Indicators:
ELA

- **Conduct a research Project to answer a question and drawing on several sources.**
- **Cite textual evidence to support analysis of science and technical texts.**
- **Write arguments focused on discipline content.**
- **Trace and evaluate the argument and specific claims that are supported by reasons and claims that are not.**
- **Determine the central ideas or conclusions of a text; provide and accurate summary of the text from prior knowledge and opinions.**
- **Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence and add interest.**
- **Write informative/explanatory texts to examine a topic and convey ideas, concepts and information through selection, organization and analysis of relevant content.**
- **Draw evidence from informational texts to support analysis, reflection and research.**
- **Gather relevant information from multiple and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.**

Math

- **Analyze the relationship between the dependent and independent variables using tables and graphs and relating this to an equation resulting from a real world problem that shows a change in a relationship between two variables.**
- **Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread and overall shape.**
- **Summarize numerical data sets in relation to their content.**
- **Reason abstractly and quantitatively.**
- **Model with mathematics.**
- **Develop understanding of statistical variability.**

Integration of 21st Century Skills

Indicators:
To function in the 21st Century work place a variety of skills need to be developed and strengthened some of those would be:

- **Developing and Using Models**
- **Planning and Carrying Out Investigations [**supported in the science lab setting but useful in many aspects of life**]**
- **Constructing Explanations and Designing Solutions** [supporting explanations with research and experimentation]
- **Engaging in Argument from Evidence**
- **Analyzing and Interpreting Data** [collected during labs or proposed scenarios]
- **Creativity and Innovation** [brainstorm, collaborate and incorporate group ideas]
- **Critical Thinking and Problem Solving** [Follow the steps of the scientific method.]
- **Communication and Collaboration** [All types of communication are needed - oral, written and nonverbal communication in a variety of forms and contexts. It is also importanat to be able to listen effectively to decipher meaning, including knowledge, values, attitudes and intentions.]
- **Information Literacy** [Use information accurately and creatively for the issue or problem at hand.]
- **Media Literacy** [Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media**.**]
- **ICT (Information, Communications and Technology) Literacy** [Use technology as a tool to research, organize, evaluate and communicate information**.**]
- **Flexibility and Adaptability** [Adapt to varied roles, jobs and responsibilities, schedules and contexts.]
- **Initiative and Self-Direction** [Set goals, balance short-term and long-term goals. Utilize time and manage workload efficiently. Monitor, define, prioritize, and complete tasks without direct oversight. Demonstrate commitment to learning as a lifelong process. Reflect critically on past experiences to continue to improve.]
- **Social and Cross-Cultural Skills** [Know when it is appropriate to listen and when to speak. Conduct themselves in a respectable manner. Learn and respect cultural differences and work effectively with people from a range of social and cultural backgrounds. Respond open-mindedly to different ideas and values.]
- **Productivity and Accountability** Set and meet goals, even in the face of obstacles.]
- **Leadership and Responsibility** [Use interpersonal and problem-solving skills to influence and guide others toward a goal. Inspire others to reach their very best via example and selflessness. Demonstrate integrity and ethical behavior in using influence and power. Act responsibly with the interests of the larger community in mind.]