Combined Curriculum Document
Science – Seventh Grade

Big Idea: Structure and Transformation of Matter (Physical Science) Grade 7
A basic understanding of matter is essential to the conceptual development of other big ideas in science. During the middle years, physical and chemical changes in matter are observed, and students begin to relate these changes to the smaller constituents of matter—namely, atoms and molecules. The use of models (and an understanding of their scales and limitations) is an effective means of learning about the structure of matter. Looking for patterns in properties is also critical to comparing and explaining differences in matter.

Academic Expectations
2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.
2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.
2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.

Program of Studies: Understandings	**Program of Studies: Skills and Concepts**	**Related Core Content for Assessment**
SC-7-STM-U-1 Students will understand that equal volumes of different substances usually have different weights.	SC-7-STM-S-1 Students will compare the physical and chemical properties of a variety of substances, including examples of solids, liquids and gases SC-7-STM-S-2 Students will distinguish between elements and compounds and classify them according to their properties	**SC-07-1.1.1** **Students will:** • **classify substances according to their chemical/reactive properties;** • **infer real life applications for substances based on chemical/reactive properties.** **In chemical reactions, the total mass is conserved. Substances are often classified into groups if they react in similar ways. The patterns which allow classification can be used to infer or understand real life applications for those substances.** **DOK 3**

SC-7-STM-U-2 Students will understand that there are only 92 naturally occurring elements and all matter is made of some combination of them (compounds).	SC-7-STM-S-2 Students will distinguish between elements and compounds and classify them according to their properties	**SC-07-1.1.1** **Students will:** • **classify substances according to their chemical/reactive properties;** • **infer real life applications for substances based on chemical/reactive properties.** **In chemical reactions, the total mass is conserved. Substances are often classified into groups if they react in similar ways. The patterns which allow classification can be used to infer or understand real life applications for those substances.** **DOK 3**
SC-7-STM-U-3 Students will understand that elements, as well as compounds, can be classified according to their similar properties, including how they react with each other and how they may be used. The patterns, which allow classification, can be used to infer or understand real life applications for those substances.	SC-7-STM-S-1 Students will compare the physical and chemical properties of a variety of substances, including examples of solids, liquids and gases SC-7-STM-S-2 Students will distinguish between elements and compounds and classify them according to their properties SC-7-STM-S-4 Students will observe reactions between substances that produce new substances very different from the reactants	**SC-07-1.1.2** **Students will:** • **classify elements and compounds according to their properties;** • **compare properties of different combinations of elements.** **Observations of simple experiments illustrate that the atoms of chemical elements do not break down during normal laboratory reactions such as heating, exposure to electric currents, or reaction with acids. Elements combine in many ways to produce compounds. Common patterns emerge when comparing and contrasting the properties of compounds to the elements from which they are made. Understanding of these patterns allows for evidence- based predictions of new or different combinations of elements/compounds.** **DOK 2**

SC-7-STM-U-4 Students will understand that many factors influence reaction rates, such as temperature, acidity and concentration.	SC-7-STM-S-5 Students will test factors that influence reaction rates	**SC-07-1.1.1** **Students will:** • **classify substances according to their chemical/reactive properties;** • **infer real life applications for substances based on chemical/reactive properties.** **In chemical reactions, the total mass is conserved. Substances are often classified into groups if they react in similar ways. The patterns which allow classification can be used to infer or understand real life applications for those substances.** **DOK 3**
SC-7-STM-U-5 Students will understand that investigations are conducted for different reasons, including to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.	SC-7-STM-S-3 Students will generate investigable questions and conduct experiments or non-experimental research to address them SC-7-STM-S-6 Students will explore real-life applications of a variety of elements and compounds and communicate findings in an authentic form (transactive writing, public speaking, multimedia presentations)	

Big Idea: Motion and Forces (Physical Science) Grade 7
Whether observing airplanes, baseballs, planets, or people, the motion of all bodies is governed by the same basic rules. At the middle level, qualitative descriptions of the relationship between forces and motion will provide the foundation for quantitative applications of Newton's Laws.

Academic Expectations
2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.
2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
2.3 Students identify and analyze systems and the ways their components work together or affect each other.

Program of Studies: Understandings	Program of Studies: Skills and Concepts	Related Core Content for Assessment
SC-7-MF-U-1 Students will understand that an object remains at rest or maintains a constant speed and direction of motion unless an unbalanced force acts on it (inertia). SC-7-MF-U-2 Students will understand that forces acting against each other can be balanced, canceling each other out and having no net effect.	SC-7-MF-S-1 Students will use appropriate tools and technology (e.g., timer, meter stick, balance, spring scale) to investigate the position, speed and motion of objects SC-7-MF-S-2 Students will test the cause and effect relationship between straight-line motion and unbalanced forces SC-7-MF-S-3 Students will investigate balanced and unbalanced forces and their effect on objects and their motion SC-7-MF-S-4 Students will make inferences and draw conclusions about the motion of objects, and predict changes in position and motion as related to the mass or force SC-7-MF-S-5 Students will calculate work as the product of force and distance moved in the direction of the force	**SC-07-1.2.1** **Students will explain the cause and effect relationship between simple observable motion and unbalanced forces.** **An object remains at rest or maintains a constant speed and direction of motion unless an unbalanced force acts on it (e.g., gravity). When an unbalanced force acts on an object, the change in speed or direction depends on the size and direction of the force.** **DOK 3**

SC-7-MF-U-3 Students will understand that gravity is an attractive force created by mass. All objects are attracted to each other by gravity, but this attraction is easy to see only when at least one of the objects has a large mass.	SC-7-MF-S-6 Students will identify gravity as a force that acts over a distance, and distinguish it from other forces that do the same (e.g. magnetism) SC-7-MF-S-7 Students will investigate the properties of gravity and observe its effects on objects SC-7-MF-S-8 Students will distinguish between weight (as a function of gravity) and mass (matter content) of an object	**SC-07-1.2.1** **Students will explain the cause and effect relationship between simple observable motion and unbalanced forces.** **An object remains at rest or maintains a constant speed and direction of motion unless an unbalanced force acts on it (e.g., gravity). When an unbalanced force acts on an object, the change in speed or direction depends on the size and direction of the force.** **DOK 3**
SC-7-MF-U-4 Students will understand that technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.	SC-7-MF-S-9 Students will explore the impact of technology on measurement by making measurements with tools of varying precision, comparing the results and predicting possible impacts that variation in measurements might have in real-life investigations	

Big Idea: The Earth and the Universe (Earth/Space Science) Grade 7
The Earth system is in a constant state of change. These changes affect life on Earth in many ways. Development of conceptual understandings about processes that shape the Earth begin at the elementary level with understanding *what* Earth materials are and that change occurs. At the middle level, students investigate *how* these changes occur. An understanding of systems and their interacting components will enable students to evaluate supporting theories of Earth changes. The use of models and observance of patterns to explain common phenomena is essential to building a conceptual foundation and supporting ideas with evidence at all levels. In middle school, students begin to look beyond what can be directly observed as they explore the Earth-sun-moon system, as well as the rest of our solar system, employing the concept of scale within their models. Patterns play an important role as students seek to develop a conceptual understanding of gravity in their world and in the universe.

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2.3 Students identify and analyze systems and the ways their components work together or affect each other.

Program of Studies: Understandings	Program of Studies: Skills and Concepts	Related Core Content for Assessment
SC-7-EU-U-1 Students will understand that regular and predictable movement is not limited to our solar system. New technologies, coupled with an understanding of the laws of motion, allow for the discovery of celestial bodies that cannot be directly observed.	SC-7-EU-S-1 Students will research how the laws of motion have been (and are still) used to make predictions about the movement of planets and satellites SC-7-EU-S-3 Students will investigate the structure of the galaxy and the Earth's place within it	**SC-07-2.3.3** **Students will describe the concept of gravity and the effect of gravitational force between the sun, moon and Earth.** **The gravitational pull of the Sun and moon on Earth's oceans as the major cause of tides can be understood from generalizations based on evidence.** **DOK 2**
SC-7-EU-U-2 Students will understand that our solar system is part of a larger collection of millions of stars (Milky Way Galaxy), any of which may be the center of its own system of orbiting planets.	SC-7-EU-S-3 Students will investigate the structure of the galaxy and the Earth's place within it	
SC-7-EU-U-3 Students will understand that gravitational interactions within the Earth, sun and moon system impact phenomena and organisms on the surface of the Earth.	SC-7-EU-S-2 Students will describe the effects of gravity on the movements and interactions of the Earth, sun and moon	**SC-07-2.3.3** **Students will describe the concept of gravity and the effect of gravitational force between the sun, moon and Earth.**

		The gravitational pull of the Sun and moon on Earth's oceans as the major cause of tides can be understood from generalizations based on evidence. **DOK 2**
SC-7-EU-U-4 Students will understand that models of the interior of the Earth have been constructed primarily from inferences based on limited data obtained during earthquakes and volcanic eruptions. These models are useful, but are open to revision or rejection as new information is obtained.	SC-7-EU-S-4 Students will analyze the evidence used to infer the composition of the Earth's interior and evaluate the models based upon that evidence	**SC-07-2.3.1** **Students will make inferences and predictions related to changes in the Earth's surface or atmosphere based on data/evidence.** **The Earth's processes we see today, including erosion, movement of lithospheric plates and changes in atmospheric composition, are predictable and similar to those that occurred in the past. Analysis of evidence from Earth's history substantiates the conclusion that the planet has also been influenced by occasional catastrophes such as the impact of an asteroid or comet.** **DOK 3**
SC-7-EU-U-5 Students will understand that the Earth's layers vary widely in their properties, and interactions between them can manifest themselves in ways that impact both the Earth and its organisms.	SC-7-EU-S-5 Students will model the layers of the Earth, explain interactions between them and describe potential results of those interactions	**SC-07-2.3.2** **Students will explain the layers of the Earth and their interactions.** **The use of models/diagrams/graphs helps illustrate that the Earth is layered. The lithosphere is the thin crust and the upper part of the mantle. Lithospheric plates move slowly in response to movements in the mantle. There is a dense core at the center of the Earth.** **DOK 2**

SC-7-EU-U-6 Students will understand that while some changes to the Earth occur without warning, many changes to the surface or atmosphere can be predicted from available data/evidence.	SC-7-EU-S-6 Students will investigate the forces and processes that change Earth's surface or atmosphere and analyze data to generate predictions of their effects	**SC-07-2.3.1** **Students will make inferences and predictions related to changes in the Earth's surface or atmosphere based on data/evidence.** **The Earth's processes we see today, including erosion, movement of lithospheric plates and changes in atmospheric composition, are predictable and similar to those that occurred in the past. Analysis of evidence from Earth's history substantiates the conclusion that the planet has also been influenced by occasional catastrophes such as the impact of an asteroid or comet.** **DOK 3**

Big Idea: Unity and Diversity (Biological Science) Grade 7
All matter is comprised of the same basic elements, goes through the same kinds of energy transformations, and uses the same kinds of forces to move. Living organisms are no exception. In middle school, students begin to compare, contrast, and classify the microscopic features of organisms—the cells, as well as investigate reproduction as the essential process to the continuation of all species. Expected patterns of genetic traits are predicted. Distinctions are made between learned behaviors and inherited traits. Emphasis at every level should be placed upon the understanding that while every living thing is composed of similar small constituents that combine in predictable ways, it is the subtle variations within these small building blocks that account for both the likenesses and differences in form and function that create the diversity of life.

Academic Expectations
2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.
2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
2.3 Students identify and analyze systems and the ways their components work together or affect each other.
2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Program of Studies: Understandings	Program of Studies: Skills and Concepts	Related Core Content for Assessment
SC-7-UD-U-1 Students will understand that specialized structures called genes are located in the chromosomes of each living cell. These structures have the task of passing on characteristics that make offspring resemble their parents (heredity).	SC-7-UD-S-2 Students will research and describe the role of genes/chromosomes in the passing of information from one generation to another (heredity)	**SC-07-3.4.1** **Students will:** • **describe the role of genes/chromosomes in the passing of information from one generation to another (heredity);** • **compare inherited and learned traits.** **Every organism requires a set of instructions for specifying its traits. This information is contained in genes located in the chromosomes of each cell that can be illustrated through the use of models. Heredity is the passage of these instructions from one generation to another and should be distinguished from learned traits.** **DOK 2**

SC-7-UD-U-2 Students will understand that inherited traits of an offspring come directly from the genes of the parent, while learned traits are acquired after birth through interactions with the offspring's surroundings	SC-7-UD-S-3 Students will describe the differences between learned and inherited behaviors and characteristics, and classify examples of each using tables, graphs or diagrams	**SC-07-3.4.1** **Students will:** • **describe the role of genes/chromosomes in the passing of information from one generation to another (heredity);** • **compare inherited and learned traits.** **Every organism requires a set of instructions for specifying its traits. This information is contained in genes located in the chromosomes of each cell that can be illustrated through the use of models. Heredity is the passage of these instructions from one generation to another and should be distinguished from learned traits.** **DOK 2**
SC-7-UD-U-3 Students will understand that asexual reproduction involves only the passing on of one parent's genes, resulting in offspring with genes identical to those of the parent. Sexual reproduction requires the combination of genes from male and female sex cells, creating offspring with a blend of traits.	SC-7-UD-S-1 Students will describe and compare sexual and asexual reproduction, including advantages and disadvantages of each	**SC-07-3.4.2** **Students will describe and compare sexual and asexual reproduction.** **Reproduction is a characteristic of all living systems and is essential to the continuation of every species as evidenced through observable patterns. A distinction should be made between organisms that reproduce asexually and those that reproduce sexually. In species that reproduce sexually, including humans and plants, male and female sex cells carrying genetic information unite to begin the development of a new individual.** **DOK 2**

SC-7-UD-U-4 Students will understand that sexual reproduction creates variations among offspring, gradually contributing to a wide variety of life.	SC-7-UD-S-4 Students will research variations within species that result from sexual reproduction	**SC-07-3.4.2** **Students will describe and compare sexual and asexual reproduction.** **Reproduction is a characteristic of all living systems and is essential to the continuation of every species as evidenced through observable patterns. A distinction should be made between organisms that reproduce asexually and those that reproduce sexually. In species that reproduce sexually, including humans and plants, male and female sex cells carrying genetic information unite to begin the development of a new individual.** **DOK 2**
SC-7-UD-U-5 Students will understand that the observable differences among humans are minor compared to their internal similarity, as evidenced by the ability of people from all over the world to physically mix through reproduction, blood transfusions and organ transplants.	SC-7-UD-S-5 Students will compare the physiological similarities among people from geographically and culturally diverse origins	**SC-07-3.4.1** **Students will:** • **describe the role of genes/chromosomes in the passing of information from one generation to another (heredity);** • **compare inherited and learned traits.** **Every organism requires a set of instructions for specifying its traits. This information is contained in genes located in the chromosomes of each cell that can be illustrated through the use of models. Heredity is the passage of these instructions from one generation to another and should be distinguished from learned traits.** **DOK 2**

SC-7-UD-U-6 Students will understand that research involving living things requires ethical considerations not required when investigating non-living things. Human subjects must be fully informed about potential risks and freely consent to any involvement. Because animals cannot make their own choices, special care must be taken in using them in scientific research.	SC-7-UD-S-6 Students will support and/or defend a position related to the ethical considerations of scientific research involving humans and other organisms, both orally and in writing	

Big Idea: Biological Change (Biological Science) Grade 7
The only thing certain is that everything changes. At the middle school level, students study relationships among populations and ecosystems that contribute to the success or demise of a specific population or species. Students construct basic explanations that can account for the great diversity among organisms.

Academic Expectations
2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.
2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.
2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Program of Studies: Understandings	Program of Studies: Skills and Concepts	Related Core Content for Assessment
SC-7-BC-U-1 Students will understand that over time, some species have become so adapted to each other that neither could survive without the other.	SC-7-BC-S-1 Students will investigate parasitic and symbiotic relationships among organisms	**SC-07-3.5.1** **Students will:** • **describe the usefulness of fossil information to make conclusions about past life forms and environmental conditions;** • **explain the cause and effect relationship of the extinction of a species and environmental changes.** **Extinction of species is common and occurs when the adaptive characteristics of a species are insufficient to allow its survival. Most of the species that have lived on Earth no longer exist. Fossils provide evidence of how environmental conditions and life have changed.** **DOK 3**

SC-7-BC-U-2 Students will understand that most of the species that have lived on Earth no longer exist. A species will become extinct when changes in environmental conditions (either gradual or rapid) are greater than its ability to adapt	SC-7-BC-S-2 Students will explore the environmental factors that have resulted in the extinction of species	**SC-07-3.5.1** **Students will:** • **describe the usefulness of fossil information to make conclusions about past life forms and environmental conditions;** • **explain the cause and effect relationship of the extinction of a species and environmental changes.** **Extinction of species is common and occurs when the adaptive characteristics of a species are insufficient to allow its survival. Most of the species that have lived on Earth no longer exist. Fossils provide evidence of how environmental conditions and life have changed.** **DOK 3**
SC-7-BC-U-3 Students will understand that fossils provide evidence of how biological change over time accounts for the diversity of species developed through gradual processes over many generations.	SC-7-BC-S-3 Students will use information from the fossil record to investigate changes in organisms and their environments to make inferences about past life forms and environmental conditions	**SC-07-3.5.1** **Students will:** • **describe the usefulness of fossil information to make conclusions about past life forms and environmental conditions;** • **explain the cause and effect relationship of the extinction of a species and environmental changes.** **Extinction of species is common and occurs when the adaptive characteristics of a species are insufficient to allow its survival. Most of the species that have lived on Earth no longer exist. Fossils provide evidence of how environmental conditions and life have changed.** **DOK 3**

SC-7-BC-U-4 Students will understand that results of scientific investigations are seldom exactly the same, but if the differences are large it is important to try to figure out why. Keeping careful records is important to help investigate what might have caused the differences.	SC-7-BC-S-4 Students will compare the results from a variety of investigations (based on similar hypotheses) to identify differences between their outcomes/conclusions and propose reasonable explanations for those discrepancies	

Big Idea: Energy Transformations (Unifying Concepts) Grade 7
Energy transformations are inherent in almost every system in the universe—from tangible examples at the elementary level, such as heat production in simple Earth and physical systems to more abstract ideas beginning at middle school, such as those transformations involved in the growth, dying and decay of living systems. The use of models to illustrate the often invisible and abstract notions of energy transfer will aid in conceptualization, especially as students move from the macroscopic level of observation and evidence (primarily elementary school) to the microscopic interactions at the atomic level (middle and high school levels).

Academic Expectations
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2.3 Students identify and analyze systems and the ways their components work together or affect each other.
2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Program of Studies: Understandings	**Program of Studies: Skills and Concepts**	**Related Core Content for Assessment**
SC-7-ET-U-1 Students will understand that most of the energy that powers the Earth's systems comes from the sun. Energy from inside the Earth, however, is responsible for some important phenomena (volcanism, plate tectonics).	SC-7-ET-S-1 Students will investigate a variety of Earth systems that are powered by solar (e.g. water cycle, climate, carbon cycle) and/or geothermal (e.g. plate tectonics, volcanism) energy	*SC-07-4.6.1* *Students will understand that Earth systems have sources of energy that are internal and external to the Earth. The Sun is the major external source of energy.*
SC-7-ET-U-2 Students will understand that the amount of energy in a closed system remains the same, so that the energy lost by a hot object equals the energy gained by a cold one.	SC-7-ET-S-3 Students will explain where energy comes from (and goes next) in a variety of real-world examples (e.g. burning, respiration, residential lighting, dry cell batteries) involving different forms of energy (e.g. heat, light, kinetic, chemical) SC-7-ET-S-6 Students will describe the kinetic molecular theory of matter SC-7-ET-S-7 Students will experiment with heat flow inside closed and open systems to explore the concept of thermal equilibrium	**SC-07-4.6.2** **Students will:** • **describe the transfer and/or transformations of energy which occur in examples that involve several different forms of energy (e.g., heat, electrical, light, motion of objects and chemical).** • **Explain, qualitatively or quantitatively, that heat lost by hot object equals the heat gained by cold object.** **The transfer and transformation of energy can be examined in a variety of real life examples. Models are an appropriate way to**

		convey the abstract/invisible transfer of energy in a system. **Heat energy is the disorderly motion of molecules. Heat can be transferred through materials by the collisions of atoms or across space by radiation. If the material is fluid, currents will be set up in it that aid the transfer of heat. To change something's speed, to bend or stretch things, to heat or cool them, to push things together, to expand or contract them or tear them apart all require transfers (and some transformations) of energy. Heat lost by hot object equals the heat gained by cold object. This is an energy conservation statement. Whenever hot and cold objects are put in contact, heat energy always transfers from the hot object to the cold object and this continues until all the mass is at the same temperature. Students should understand that heat produced by burning comes from the release of chemical energy of the substance.** **DOK 3**
SC-7-ET-U-3 Students will understand that all energy must have a source and may change forms or be transferred in a wide variety of ways, including via waves.	SC-7-ET-S-3 Students will explain where energy comes from (and goes next) in a variety of real-world examples (e.g. burning, respiration, residential lighting, dry cell batteries) involving different forms of energy (e.g. heat, light, kinetic, chemical) SC-7-ET-S-4 Students will identify forms of energy that are transferred via waves	*SC-07-4.6.3* *Students will understand that waves are one way that energy is transferred. Types of waves include sound, light, earthquake, ocean and electromagnetic.*

SC-7-ET-U-4 Students will understand that thermal energy and motion are inseparable when viewed at the molecular level.	SC-7-ET-S-5 Students will equate work done on an object with change in energy of the object SC-7-ET-S-6 Students will describe the kinetic molecular theory of matter	**SC-07-4.6.2** **Students will:** • **describe the transfer and/or transformations of energy which occur in examples that involve several different forms of energy (e.g., heat, electrical, light, motion of objects and chemical).** • **Explain, qualitatively or quantitatively, that heat lost by hot object equals the heat gained by cold object.** **The transfer and transformation of energy can be examined in a variety of real life examples. Models are an appropriate way to convey the abstract/invisible transfer of energy in a system.** **Heat energy is the disorderly motion of molecules. Heat can be transferred through materials by the collisions of atoms or across space by radiation. If the material is fluid, currents will be set up in it that aid the transfer of heat. To change something's speed, to bend or stretch things, to heat or cool them, to push things together, to expand or contract them or tear them apart all require transfers (and some transformations) of energy. Heat lost by hot object equals the heat gained by cold object. This is an energy conservation statement. Whenever hot and cold objects are put in contact, heat energy always transfers from the hot object to the cold object and this continues until all the mass is at the same temperature. Students should understand that heat produced by burning comes from the release of chemical energy of the substance.** **DOK 3**

SC-7-ET-U-5 Students will understand that the role various organisms play within an ecosystem can be determined by observing the flow of energy between them.	SC-7-ET-S-2 Students will model, explain and analyze the flow of energy in ecosystems and draw conclusions about the role of organisms in an ecosystem	**SC-07-4.6.4** **Students will describe or represent the flow of energy in ecosystems, using data to draw conclusions about the role of organisms in an ecosystem.** **For most ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism in food webs.** **DOK 3**
SC-7-ET-U-6 Students will understand that systems tend to change until they become stable and remain that way unless conditions change.	SC-7-ET-S-5 Students will equate work done on an object with change in energy of the object SC-7-ET-S-6 Students will describe the kinetic molecular theory of matter SC-7-ET-S-7 Students will experiment with heat flow inside closed and open systems to explore the concept of thermal equilibrium	**SC-07-4.6.2** **Students will:** • **describe the transfer and/or transformations of energy which occur in examples that involve several different forms of energy (e.g., heat, electrical, light, motion of objects and chemical).** • **Explain, qualitatively or quantitatively, that heat lost by hot object equals the heat gained by cold object.** **The transfer and transformation of energy can be examined in a variety of real life examples. Models are an appropriate way to convey the abstract/invisible transfer of energy in a system.** **Heat energy is the disorderly motion of molecules. Heat can be transferred through materials by the collisions of atoms or across space by radiation. If the material is fluid, currents will be set up in it that aid the transfer of heat. To change something's speed, to bend or stretch things, to heat or cool them, to push things together, to**

		expand or contract them or tear them apart all require transfers (and some transformations) of energy. Heat lost by hot object equals the heat gained by cold object. This is an energy conservation statement. Whenever hot and cold objects are put in contact, heat energy always transfers from the hot object to the cold object and this continues until all the mass is at the same temperature. Students should understand that heat produced by burning comes from the release of chemical energy of the substance. **DOK 3**

Big Idea: Interdependence (Unifying Concepts) Grade 7
It is not difficult for students to grasp the general notion that species depend on one another and on the environment for survival. But their awareness must be supported by knowledge of the kinds of relationships that exist among organisms, the kinds of physical conditions that organisms must cope with, the kinds of environments created by the interaction of organisms with one another and their physical surroundings, and the complexity of such systems. In middle school, students should be guided from specific examples of the interdependency of organisms to a more systematic view of the interactions that take place among organisms and their surroundings. Students growing understanding of systems in general will reinforce the concept of ecosystems. Stability and change in ecosystems can be considered in terms of variables such as population size, number and kinds of species, productivity, and the effect of human intervention.

Academic Expectations
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2.3 Students identify and analyze systems and the ways their components work together or affect each other.
2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Program of Studies: Understandings	Program of Studies: Skills and Concepts	Related Core Content for Assessment
SC-7-I-U-1 Students will understand that species may become extinct even if environmental conditions remain constant. Competition between species for limited resources can result in extinction. SC-7-I-U-2 Students will understand that changes within an ecosystem may be caused by the interactions of many factors, both biotic and abiotic. Seemingly small changes can have significant consequences as their effects ripple through a community.	SC-7-I-S-1 Students will research and investigate environmental situations where small changes may have large impacts in both living and non-living components of systems (e.g., introduction of zebra mussels into the Kentucky river, planting kudzu to stabilize hillsides) SC-7-I-S-2 Students will investigate potential factors contributing to endangerment or extinction, including the effects of competition for resources SC-7-I-S-3 Students will identify a species which has become extinct and analyze data/evidence to infer the contributing factors which led to extinction	**SC-07-4.7.1** **Students will compare abiotic and biotic factors in an ecosystem in order to explain consequences of change in one or more factors.** **The number of organisms an ecosystem can support depends on the resources available and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition). Given adequate biotic and abiotic resources and no diseases or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.** **DOK 3**

	SC-7-I-S-5 Students will design and conduct investigations of changes to abiotic and biotic factors in ecosystems, document and communicate observations, procedures, results and conclusions	
SC-7-I-U-3 Students will understand that not all actions/decisions have the possibility of a desirable outcome. Sometimes a compromise requires accepting one unwanted outcome to avoid a different unwanted outcome.	SC-7-I-S-4 Students will research and discuss environmental impacts of actions (human or non-human) which necessitate choosing between undesirable alternatives (e.g., losing crops to insects vs. applying toxic pesticides)	