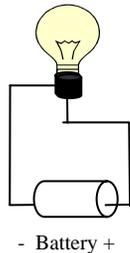


Glossary

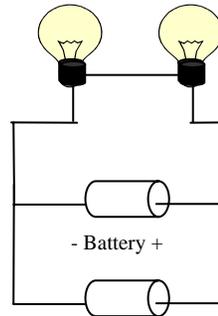
This glossary is not intended as a comprehensive glossary of science terms or science education terms. Words defined here are a compiled list of terms that are defined in grade level Teacher Notes within the Kansas Science Education Standards. After each term, the grade level where the definition is applied is KSES is noted.

Circuits (KSES Gr. K-4)

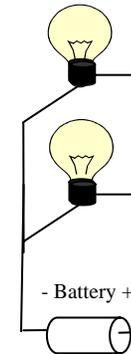
Simple circuit – include diagram



Series circuit –include diagram



Parallel circuit - - include diagram



Classify – a method for establishing order on collections of objects or events. Students use classification systems to identify objects or events, to show similarities, differences, and interrelationships. It is important to realize that all classification systems are subjective and may change as criteria change; the test for good classification system is whether others can use it. (KSES Gr. K-4)

Current is the rate at which charges are flowing in a circuit. (KSES Gr. K-4)

Environment – all external conditions and factors, living and non-living, that affect an organism during its life time. (KSES Gr. K-4)

Full inquiry – involves asking a simple question, completing an investigation, answering the question, and presenting the results to others. In elementary grades, students begin to develop the physical and intellectual abilities of scientific inquiry. They can design investigations to try things to see what happens – they tend to focus on concrete results of tests and will entertain the idea of a “fair” test (a test in which only one variable at a time is changed) (see page 122 in the National Science Education Standards, 1996). (KSES Gr. K-4)

Earth materials - rocks, soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties which make them useful in different ways. (KSES Gr. K-4)

Fossil - is a part of a once-living organism or a trace of an organism preserved in rock. (KSES Gr. K-4)

Erosion – movement of earth materials from one place to another. (KSES Gr. K-4)

Interact- when two or more things do something to each other. (KSES Gr. K-4)

Investigation – finding the answer to a question. (KSES Gr. K-4)

Life cycle – the process by which organisms mature, reproduce, and die. (KSES Gr. K-4)

Mass - measure of the amount of material something contains. (KSES Gr. K-4)

Organisms – any form of life. (KSES Gr. K-4)

Properties – a word that describes an object based on direct observations using touch, sight, hearing, taste, smell, and measurement. (KSES Gr. K-4)

Scientific investigation – A scientific investigation uses scientific inquiry to ask an answer a question. (KSES Grades 5-7)

Scientific inquiry – The diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to the activities students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world. Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative (scientific) explanations. Students will engage in selected aspects of inquiry (partial or guided inquiry) as they learn the scientific way of knowing the natural world, but they also should develop the capacity to conduct complete investigations (full inquiry). (From the National Education Standards, p. 23) (KSES Gr. 5-7)

Technology - Creates products to meet human needs by applying scientific principles. Science and technology are reciprocal. Science helps drive technology. Technology is essential to science, because it provides instruments and techniques that promote scientific inquiry. (KSES Grades 5-7)

Structures – parts of the organism that serve different functions in growth, survival, and reproduction. (KSES Gr. K-4)

Technology – application of knowledge through inventions. (see 8-12 Standard 5 document)

Tools – object used to achieve a goal, to make an observation, and extend the senses (see page 122 in the National Science Education Standards, 1996). (KSES Gr. K-4)

Weight – The response of mass to the pull of gravity. Weight is a measure of force. Note: Weight is often confused with mass. Mass is the amount matter (stuff) an object has and is not dependent on the object's location. Weight is a measure of force and is not constant because the pull of gravity on an object's mass varies with location. An object would weight less on Earth than on Jupiter because Jupiter has greater mass than Earth; Jupiter's mass would have a greater gravitational attraction for the object. (KSES Gr. 5-7)

Bibliography

American Association for the Advancement of Science Project 2061: (1993). *Benchmarks for Science Literacy*. New York: Oxford University Press.

Kansas State Department of Education (2001). *Kansas Science Education Standards*. Topeka, KS, KSDE.

Lowery, L. R. (1989). *The Biological Basis of Thinking and Learning*. Berkeley, CA: Lawrence Hall of Science, University of California – Berkeley.

McREL (MidContinent Research and Education Leadership), *Review of Kansas Science Education Standards Draft 2d*, 2005.

National Academy of Sciences (1996). *National Science Education Standards*. Washington, D. C.: National Academy Press.

National Academy of Sciences (1998). *Teaching about Evolution and the Nature of Science*. Washington, D. C.: National Academy Press.

National Science Teachers Association (1996). *Pathways to the Science Standards – High School Edition*. Washington, D. C.: NSTA Press.

National Science Teachers Association (1997). *Pathways to the Science Standards – Elementary School Edition*. Washington, D. C.: NSTA Press.

National Science Teachers Association (1998). *Pathways to the Science Standards – Middle School Edition*. Washington, D. C.: NSTA Press.

Appendix I

K-4 Grade-by-Grade Kansas Science Standards

The Kansas State Science Education Standards include standards, benchmarks, indicators, and examples which are designed to assist Kansas educators in selecting and developing local curricula, carrying out instructions, and assessing students' progress. They will also serve as the foundation for the development of state assessments in science. These standards, benchmarks, indicators, and examples represent high, yet reasonable expectations for all students.

The Kansas State Science Education Standards:

- Bring coordination, consistency, and coherence to the improvement of science education in Kansas.
- ***Advocate that science education must be developmentally appropriate and reflect a systematic, progressive approach throughout the elementary, middle, and high school years.***
- Are not intended to be viewed as a state curriculum or instructional strategy. The content embodied in the standards can be organized and presented with many different emphases and perspectives in local district curricula.

Purpose of this Document

This document is one example of a breakdown of indicators into grade levels. This particular breakdown is not intended to be the only organizational option but give developmentally appropriate guidance in designing local curricula.

There are two different versions of the same indicator breakdown. The first is simply a list of indicators. The second style is the same information with more supporting documentation.

A suggested vocabulary list has been included to give guidance as to vocabulary that is necessary for achieving proficiency on the state assessment and to help develop a scientific literate society. This list was developed using state standards and test specifications.

Kindergarten Recommendations

(Derived from K-2 Standards Document)

Science	
1.1.1	The student identifies properties of objects
1.1.5	describes an observation orally or pictorially.
2.1.2	separates or sorts a group of objects or materials by properties.
3.1.4	examines the structures/parts of living things.
4.2.1	observes and recognizes the sun, moon, stars, clouds, birds, airplanes and other objects in the sky.
4.2.2	describes that the sun provides light and warmth.
4.3.1	observes changes in the weather from day to day.
4.3.3	discusses weather safety procedures.
5.1.1	explores the way things work.
6.1.1	engages in personal care.
6.1.2	discusses healthy foods.
6.1.3	discusses that humans need to practice being safe.
7.1.1	is involved in explorations that make his/her mind wonder and know that he/she is practicing science.
7.1.2	uses technology to learn about people in science.

K-2 Common Vocabulary	Kindergarten Vocabulary
describe	airplanes
explore	birds
objects	clouds
observe	health
organism	light
properties	material
safety	moon
scientist	personal care
structure	safety
weather	sky
predict	sort
graph	stars
nutrition	sun
texture	warmth

1st Grade Recommendations

(Derived from K-2 Standards Document)

Science	
1.1.2	The student classifies and arranges groups of objects by a variety of properties, one property at a time.
1.1.5	describes an observation orally or pictorially.
2.1.3	compares the properties of solids and liquids.
2.1.4	describes the position of an object in relation to other objects.
3.1.1	discusses that organisms live only in environments in which their needs can be met.
3.1.3	observes living things in various environments
3.1.4	examines the structures/parts of living things.
4.1.1	observes, compares, and sorts earth materials.
4.3.3	discusses weather safety procedures.
5.1.1	explores the way things work.
6.1.1	engages in personal care.
6.1.2	discusses healthy foods.
6.1.3	discusses that humans need to practice being safe.
7.1.1	is involved in explorations that make his/her mind wonder and know that he/she is practicing science.
7.1.2	uses technology to learn about people in science.

K-2 Common Vocabulary	1 st grade Vocabulary
describe	basic needs
explore	classify (sort)
objects	compare
observe	earth materials
organism	examine
properties	liquid
safety	personal care
scientist	safety
structure	solid
weather	habitat
Predict	
Graph	
Nutrition	
texture	

2nd Grade Recommendations

(Derived from K-2 Standards Document)

Science	
1.1.3	The student uses appropriate materials, tools, and safety procedures to collect information.
1.1.4	asks and answers questions about objects, organisms, and events in his/her environment.
1.1.5	describes an observation orally or pictorially.
2.1.1	observes properties of objects and measures or describes those properties using age-appropriate tools and materials.
3.1.2	observes life cycles of different living things.
3.1.4	examines the structures/parts of living things.
4.3.2	records weather changes daily.
4.3.3	discusses weather safety procedures.
5.1.2	experiences science through technology.
6.1.1	engages in personal care.
6.1.2	discusses healthy foods.
6.1.3	discusses that humans need to practice being safe.
7.1.1	Is involved in explorations that make his/her mind wonder and know that he/she is practicing science.
7.1.2	uses technology to learn about people in science.

K-2 Common Vocabulary	2nd Grade Vocabulary
describe	events
explore	health
objects	life cycle
observe	measure
organism	safety
properties	tool
safety	habitat
scientist	thermometer
structure	magnifiers
weather	balances
predict	scales
graph	measuring cups
nutrition	measuring spoons
texture	

3rd Grade Recommendations

(Derived from 3-4 Standards Document)

Science	
1.1.1	▲ The student asks questions that he/she can answer by investigating.
1.1.2	▲ plans and conducts a simple investigation.
1.1.3	▲ employs appropriate equipment, tools, and safety procedures to gather data.
1.1.4	▲ begins developing the abilities to communicate, critique, analyze his/her own investigations, and interprets the work of other students.
2.1.2	▲ describes and classifies objects by more than one property.
2.1.3	▲ observes and records how one object interacts with another object.
2.1.4	▲ recognizes and describes the differences between solids, liquids, and gases
2.2.1	▲ moves objects by pushing, pulling, throwing, spinning, dropping, and rolling; and describes the motion.
2.2.2	describes the change in position of objects when moved.
2.4.1	▲ demonstrates that magnets attract and repel.
3.1.1	▲ observes different organisms and compares and contrasts how similar functions are served by different structural characteristics.
3.1.2	▲ compares basic needs of different organisms in their environment.
3.1.3	discusses ways organisms use their senses to survive in their environments.
4.1.1	▲ collects, observes properties, and classifies a variety of earth materials in his/her environment.
4.1.2	experiments with a variety of soil types (clay, silt, sand, and loam)
4.2.1	observes the moon and stars.
4.2.2	observes and compares the length of shadows.
4.2.3	▲ discusses that the sun provides light and heat (electromagnetic radiation) to maintain the temperature of earth.
5.1.1	▲ identifies a simple design problem (designs a plan, implements a plan, evaluates the results, makes changes to improve the product, and communicates the results.)
5.2.1	will understand that the design process produces knowledge that can be used to solve a problem and improve our world.
5.2.2	invents a product to solve problems.
5.2.3	works with others to solve problems.
5.2.5	investigates how scientists use tools to observe.
6.1.1	▲ discusses the nutritional value of various foods and their contribution to health.
6.1.2	discusses that safety involves preventing injury by avoiding inappropriate risks and dangers.
6.1.3	assumes some responsibility for his/her own health, and the health and well being of others.
6.2.1	defines pollution.
6.2.3	practices reducing, reusing, and recycling.

7.1.1	recognizes that students participate in science inquiry by asking questions. (ties in with 1.1.1)
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Grades 3-4 Common Vocabulary	Grade 3 Content Vocabulary	Grade 3 Tested Vocabulary
Analyze	Clay	Analyze
Compare	Silt	Basic needs
Contrast	Sand	Characteristics
Evidence	Loam	Critique
Inquiry	Evaluate	Design
Interpret	Inquiry	Earth materials
Investigate	Invent	Environment
Observes	Pollution	Equipment
Organism	Reduce	Evaluate
Properties	Reuse	Function
Records	Recycle	Interpret
Technology	Soil	Magnets, attract, repel
Tools	Survive	Motion
Predict	humus	Nutritional value
Problem		Pushing, pulling, throwing
Procedure		Safety procedures
Graph		Solid, liquid, gas
Nutrition		Spinning, dropping
Texture		Rolling
Experiment		Structure
Risk		Poles
Injury		Habitat
hygiene		Hand lens
		Meter stick
		Tape measure
		Measuring cups
		Balance
		Thermometer
		Spring scale
		Graduated cylinder
		Dropper
		stopwatch

4th Grade Recommendations

(Derived from 3-4 Standards Document)

Science	
1.1.1	▲ The student asks questions that he/she can answer by investigating.
1.1.2	▲ plans and conducts a simple investigation.
1.1.3	▲ employs appropriate equipment, tools, and safety procedures to gather data.
1.1.4	▲ begins developing the abilities to communicate, critique, analyze his/her own investigations, and interprets the work of other students.
2.1.1	▲ observes properties of objects and measures those properties using appropriate tools.
2.1.3	▲ observes and records how one object interacts with another object.
2.3.1	▲ identifies that the source of sound is vibrations.
2.3.2	discriminates between sounds made by different objects.
2.3.3	discriminates between various pitches.
2.4.2	▲ designs a simple experiment to determine whether various objects will be attracted to magnets.
2.4.3	▲ constructs a simple circuit.
3.2.1	▲ compares, contrasts, and asks questions about life cycles of various organisms.
4.1.3	▲ describes properties of water and the process of the water cycle.
4.1.4	observes and records the properties of fossils and discusses what fossils are.
4.3.1	▲ describes changes in the surface of the earth.
4.3.2	▲ observes, describes, and records daily and seasonal weather changes.
5.1.1	▲ identifies a simple design problem (designs a plan, implements the plan, evaluates the results, makes changes to improve the product, and communicates the results.)
5.2.1	will understand that the design process produces knowledge that can be used to solve a problem and improve our world.
5.2.4	develops an awareness that women and men of all ages, backgrounds, and ethnic groups engage in a variety of scientific and technological work.
6.1.1	▲ discusses the nutritional value of various foods and their contribution to health.
6.1.2	discusses that safety involves preventing injury by avoiding inappropriate risks and dangers.
6.1.3	assumes some responsibility for his/her own health, and the health and well being of others.
6.2.2	develops personal actions to solve pollution problems in and around the neighborhood.

7.1.2	studies the lives of people who made scientific contributions.
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Grades 3-4 Common Vocabulary	Grade 4 Content Vocabulary	Grade 4 Tested Vocabulary
Analyze	Communicate	Equipment
Compare	Fossils	Erosion
Contrast	Interact	Evaluate
Evidence	Pitch	Implement
Inquiry	Pollution	Interact
Interpret	Safety	Safety procedures
Investigate	Weather	Simple circuit
Observes	Records	Sound
Organism	Technology	Vibration
Properties	Tools	Water cycle
Predict	Volume	Design problem
Problem		Simple parallel circuit
Procedure		Simple series circuit
Graph		Conduct electricity
Thermometer		Metamorphosis
Nutrition		Complete circuit
Texture		Design problem
Energy		Hand lens
Habitat		Meter stick
Experiment		Tape measure
Risk		Measuring cup
Injury		Balance
Hygiene		Thermometer
		Spring scale
		Graduated cylinder
		Dropper
		Stopwatch

Kindergarten

STANDARD 1: SCIENCE AS INQUIRY

The student will experience science as *full inquiry*. In the elementary grades, students begin to develop the physical and intellectual abilities of scientific inquiry.

Benchmark 1: The student will be involved in activities that develop skills necessary to conduct scientific inquiries.

1. The student identifies properties of objects.
5. The student describes an observation orally or pictorially.

STANDARD 2: PHYSICAL SCIENCE

The students will explore the world by observing and manipulating common objects and materials in their environment.

Benchmark 1: All students will develop skills to describe objects.

2. The student separates or sorts a group of objects or materials by properties.

STANDARD 3: LIFE SCIENCE

The student will begin to develop an understanding of biological concepts.

Benchmark 1: The student will develop an understanding of the characteristics of living things.

4. The student examines the structures/parts of living things.

STANDARD 4: EARTH AND SPACE SCIENCE

The student will observe closely the objects and materials in their *environment*.

Benchmark 2: The student will observe and compare objects in the sky.

1. The student observes and recognizes the sun, moon, stars, clouds, birds, airplanes, and other objects in the sky.
2. The student describes that the sun provides light and warmth.

Benchmark 3: The student will describe changes in weather.

1. The student observes changes in the weather from day to day.
3. The student discusses weather safety procedures.

STANDARD 5: SCIENCE AND TECHNOLOGY

The student will have a variety of educational experiences that involve science and *technology*.

Benchmark 1: The student will use technology to learn about the world around them.

1. The student explores the way things work.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES

The student will have a variety of experiences that provide understandings for various science-related personal and environmental challenges.

Benchmark 1: The student will demonstrate responsibility for their own health.

1. The student engages in personal care.
2. The student discusses healthy foods.
3. The student discusses that humans need to practice being safe.

STANDARD 7: HISTORY AND NATURE OF SCIENCE

The student will experience scientific inquiry and learn about people from history.

Benchmark 1: The student will know they practice science.

1. The student is involved in explorations that make his/her mind wonder and know that he/she is practicing science.
2. The student uses technology to learn about people in science.

Grade 1

STANDARD 1: SCIENCE AS INQUIRY

The student will experience science as *full inquiry*. In the elementary grades, students begin to develop the physical and intellectual abilities of scientific inquiry.

Benchmark 1: The student will be involved in activities that develop skills necessary to conduct scientific inquiries.

2. The student classifies and arranges groups of objects by a variety of properties, one property at a time.
5. The student describes an observation orally or pictorially.

STANDARD 2: PHYSICAL SCIENCE

The students will explore the world by observing and manipulating common objects and materials in their environment.

Benchmark 1: All students will develop skills to describe objects.

3. The student compares solids and liquids.
4. The student describes the position of an object in relation to other objects.

STANDARD 3: LIFE SCIENCE

The student will begin to develop an understanding of biological concepts.

Benchmark 1: The student will develop an understanding of the characteristics of living things.

1. The student discusses that organisms live only in environments in which their needs can be met.
3. The student observes living things in various environments.
4. The student examines the structures/parts of living things.

STANDARD 4: EARTH AND SPACE SCIENCE

The student will observe closely the objects and materials in their *environment*.

Benchmark 1: The student will describe properties of earth materials.

1. The student observes, compares, and sorts earth materials.

Benchmark 3: The student will describe changes in weather.

3. The student discusses weather safety procedures.

STANDARD 5: SCIENCE AND TECHNOLOGY

The student will have a variety of educational experiences that involve science and *technology*.

Benchmark 1: The student will use technology to learn about the world around them.

1. The student explores the way things work.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES

The student will have a variety of experiences that provide understandings for various science-related personal and environmental challenges.

Benchmark 1: The student will demonstrate responsibility for their own health.

1. The student engages in personal care.
2. The student discusses healthy foods.
3. The student discusses that humans need to practice being safe.

STANDARD 7: HISTORY AND NATURE OF SCIENCE

The student will experience scientific inquiry and learn about people from history.

Benchmark 1: The student will know they practice science.

1. The student is involved in explorations that make his/her mind wonder and know that he/she is practicing science.
2. The student uses technology to learn about people in science.

Grade 2

STANDARD 1: SCIENCE AS INQUIRY

The student will experience science as *full inquiry*. In the elementary grades, students begin to develop the physical and intellectual abilities of scientific inquiry.

Benchmark 1: The student will be involved in activities that develop skills necessary to conduct scientific inquiries.

3. The student uses appropriate materials, tools, and safety procedures to collect information.
4. The student asks and answers questions about objects, organisms, and events in his/her environment.
5. The student describes an observation orally or pictorially.

STANDARD 2: PHYSICAL SCIENCE

The students will explore the world by observing and manipulating common objects and materials in their environment.

Benchmark 1: All students will develop skills to describe objects.

1. The student observes properties of objects and measures or describes those properties using age-appropriate tools and materials.

STANDARD 3: LIFE SCIENCE

The student will begin to develop an understanding of biological concepts.

Benchmark 1: The student will develop an understanding of the characteristics of living things.

2. The student observes life cycles of different living things.
4. The student examines the structures/parts of living things.

STANDARD 4: EARTH AND SPACE SCIENCE

The student will observe closely the objects and materials in their *environment*.

Benchmark 3: The student will describe changes in weather.

2. The student records weather changes daily.
3. The student discusses weather safety procedures.

STANDARD 5: SCIENCE AND TECHNOLOGY

The student will have a variety of educational experiences that involve science and *technology*.

Benchmark 1: The student will use technology to learn about the world around them.

2. The student experiences science through technology.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES

The student will have a variety of experiences that provide understandings for various science-related personal and environmental challenges.

Benchmark 1: The student will demonstrate responsibility for their own health.

1. The student engages in personal care.
2. The student discusses healthy foods.
3. The student discusses that humans need to practice being safe.

STANDARD 7: HISTORY AND NATURE OF SCIENCE

The student will experience scientific inquiry and learn about people from history.

Benchmark 1: The student will know they practice science.

1. The student is involved in explorations that make his/her mind wonder and know that he/she is practicing science.
2. The student uses technology to learn about people in science.

Grade 3

STANDARD 1: SCIENCE AS INQUIRY

The student will experience science as *full inquiry*. In the elementary grades, students begin to develop the physical and intellectual abilities of scientific inquiry.

Benchmark 1: The student will develop the skills necessary to do full inquiry. *Full inquiry* involves asking a simple question, completing an *investigation*, answering the question, and sharing the results with others.

1. ▲ The student asks questions that he/she can answer by investigating.
2. ▲ The student plans and conducts a simple investigation.
3. ▲ The student employs appropriate equipment, tools, and safety procedures to gather data.
4. ▲ The student begins developing the abilities to communicate, critique, analyze his/her own investigations, and interprets the work of other students.

STANDARD 2: PHYSICAL SCIENCE

The student will increase their understanding of the *properties* of objects and materials that they encounter on a daily basis. The student will compare, describe, and sort and *classify* these materials by observable properties.

Benchmark 1: The student will develop skills to describe objects.

2. ▲ The student describes and classifies objects by more than one property.
3. ▲ The student observes and records how one object interacts with another object.
4. ▲ The student recognizes and describes the differences between solids, liquids, and gases.

Benchmark 2: The student will describe the movement of objects.

1. ▲ The student moves objects by pushing, pulling, throwing, spinning, dropping, and rolling; and describes the motion.
2. The student describes change in position of objects when moved.

Benchmark 4: The student will experiment with electricity and magnetism.

1. ▲ The student demonstrates that magnets attract and repel.

STANDARD 3: LIFE SCIENCE

The student will develop an understanding of biological concepts through direct experience with living things, their life cycles, and their habitats.

Benchmark 1: The student will develop knowledge of organisms in their environment.

1. ▲ The student observes different organisms and compares and contrasts how similar functions are served by different structural characteristics.
2. ▲ The student compares basic needs of different organisms in their environment.
3. The student discusses ways organisms use their senses to survive in their environments.

STANDARD 4: EARTH AND SPACE SCIENCE

The student will observe objects, materials, and changes in their environment, note their properties, distinguish one from another, and develop their own explanations making sense of their observations.

Benchmark 1: The student will develop an understanding of the properties of *earth materials*.

1. ▲ The student collects, observes properties, and classifies a variety of earth materials in his/her environment.
2. The student experiments with a variety of soils types (clay, silt, sand, and loam).

Benchmark 2: The student will observe and describe objects in the sky.

1. The student observes the moon and stars.
2. The student observes and compares the length of shadows.
3. ▲ The student discusses that the sun provides light and heat (electromagnetic radiation) to maintain the temperature of the earth.

STANDARD 5: SCIENCE AND TECHNOLOGY

The student will have a variety of educational experiences which involve science and technology. The student will begin to understand the design process.

Benchmark 1: The student will work with a technology design.

1. ▲ The student identifies a simple design problem (designs a plan, implements the plan, evaluates the results, makes changes to improve the product, and communicates the results).

Benchmark 2: The student will apply their understanding about science

and technology.

1. The student will understand that the design process produces knowledge that can be used to solve a problem and improve our world.
2. The student invents a product to solve problems.
3. The student works with others to solve problems.
5. The student investigates how scientists use tools to observe.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES

The student will demonstrate personal health and environmental practices.

Benchmark 1: The student will develop an understanding of personal health.

1. ▲ The student discusses the nutritional value of various foods and their contribution to health.
2. The student discusses that safety involves preventing injury by avoiding inappropriate risks and dangers.
3. The student assumes some responsibility for his/her own health, and the health and well being of others.

Benchmark 2: The student will demonstrate an awareness of changes in the environment.

1. The student defines pollution.
3. The student practices reducing, reusing, and recycling.

STANDARD 7: HISTORY AND NATURE OF SCIENCE

The student will experience some things about scientific inquiry and learn about people from history. Benchmark 1: The student will develop an awareness that people practice science.

1. The student recognizes that students participate in science inquiry by asking questions. (ties in with 1.1.1)

Grade 4

STANDARD 1: SCIENCE AS INQUIRY

The student will experience science as *full inquiry*. In the elementary grades, students begin to develop the physical and intellectual abilities of scientific inquiry.

Benchmark 1: The student will develop the skills necessary to do full inquiry. *Full inquiry* involves asking a simple question, completing an *investigation*, answering the question, and sharing the results with others.

1. ▲The student asks questions that he/she can answer by investigating.
2. ▲The student plans and conducts a simple investigation.
3. ▲The student employs appropriate equipment, tools, and safety procedures to gather data.
4. ▲The student begins developing the abilities to communicate, critique, analyze his/her own investigations, and interprets the work of other students.

STANDARD 2: PHYSICAL SCIENCE

The student will increase their understanding of the *properties* of objects and materials that they encounter on a daily basis. The student will compare, describe, and sort and *classify* these materials by observable properties.

Benchmark 1: The student will develop skills to describe objects.

1. ▲The student observes properties of objects and measures those properties using appropriate tools.
3. ▲The student observes and records how one object interacts with another object.

Benchmark 3: The student will recognize and demonstrate what makes sounds.

1. ▲The student identifies that the source of sound is vibrations.
2. The student discriminates between sounds made by different objects.
3. The student discriminates between various pitches

Benchmark 4: The student will experiment with electricity and magnetism.

2. ▲The student designs a simple experiment to determine whether various objects will be attracted to magnets.
3. ▲The student constructs a simple circuit.

STANDARD 3: LIFE SCIENCE

The student will develop an understanding of biological concepts through direct experience with living things, their life cycles, and their habitats.

Benchmark 2: The student will observe and illustrate the life cycles of various organisms.

1. ▲ The student compares, contrasts, and asks questions about life cycles of various organisms.

STANDARD 4: EARTH AND SPACE SCIENCE

The student will observe objects, materials, and changes in their environment, note their properties, distinguish one from another, and develop their own explanations making sense of their observations.

Benchmark 1: The student will develop an understanding of the properties of *earth materials*.

3. ▲ The student describes properties of water and the process of the water cycle.
4. The student observes and records the properties of fossils and discusses what fossils are.

Benchmark 3: The student will develop skills necessary to describe changes in the earth and weather.

1. ▲ The student describes changes in the surface of the earth.
2. ▲ The student observes, describes, and records daily and seasonal weather changes.

Standard 5: SCIENCE AND TECHNOLOGY

The student will have a variety of educational experiences which involve science and technology. The student will begin to understand the design process.

Benchmark 1: The student will work with a technology design.

1. ▲ The student identifies a simple design problem (designs a plan, implements the plan, evaluates the results, makes changes to improve the product, and communicates the results).

Benchmark 2: The student will apply their understanding about science and technology.

1. The student will understand that the design process produces knowledge that can be used to solve a problem and improve our world.
4. The student develops an awareness that women and men of all ages, backgrounds, and ethnic groups engage in a variety of scientific and technological work.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES

The student will demonstrate personal health and environmental practices.

Benchmark 1: The student will develop an understanding of personal health.

1. ▲ The student discusses the nutritional value of various foods and their contribution to health.
2. The student discusses that safety involves preventing injury by avoiding inappropriate risk and dangers.
3. The student assumes some responsibility for his/her own health, and the health and well being of others.

Benchmark 2: The student will demonstrate an awareness of changes in the environment.

2. The student develops personal actions to solve pollution problems in and around the neighborhood.

STANDARD 7: HISTORY AND NATURE OF SCIENCE

The student will experience some things about scientific inquiry and learn about people from history.

Benchmark 1: The student will develop an awareness that people practice science.

2. The student studies the lives of people who made scientific contributions.

Appendix II

5-7 Grade Level Assigned Indicators

Introduction

Two recommended formats for 5th, 6th, and 7th grade science indicator alignment are provided in this appendix. These formats incorporate all the Kansas State Science Standards and include: *Integrated and Standard-Specific* versions. These are only recommendations to help guide districts with curriculum alignment in science using the resources available to them.

In both formats, Standard 1 (Science as Inquiry), Standard 5 (Science and Technology), Standard 6 (Science in Personal and Environmental Perspectives), & Standard 7 (History and Nature of Science) should be taught at all grade levels. All standards, benchmarks, and indicators have been addressed in both formats.

The *integrated format* has assigned certain indicators to grade levels based on the difficulty of the indicator and other related indicators. The assigned indicators should be mastered in the assigned grade level as appropriate for the age group.

The *standard-specific format* has assigned a certain standard to a certain grade level. Fifth grade has been assigned Standard 4 (Earth and Space Science). Sixth grade has been assigned Standard 2 (Physical Science). Seventh grade has been assigned Standard 3 (Life Science).

These formats are solely recommendations. They may be changed to meet the needs of each individual district. This document is to be used in addition to the Kansas Curricular Standards for Science. They can be found on the Kansas State Department of Education website at: www.ksde.org (from the left bar select educators, standards, science).

For further assistance on each of the assessed indicators, please refer to the Science Test Items Specifications also located on the KSDE website (from the left bar select educators, assessments, science assessments, science test items specifications).

Summary of the Kansas Science Standards

STANDARD 1: SCIENCE AS INQUIRY

The student will develop the abilities to do *scientific inquiry*, be able to demonstrate how *scientific inquiry* is applied, and develop understandings about *scientific inquiry*.

STANDARD 2: PHYSICAL SCIENCE

The student will apply process skills to develop an understanding of physical science including: properties, changes of properties of matter, motion and forces, and transfer of energy.

STANDARD 3: LIFE SCIENCE

The student will apply process skills to explore and understand structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, and diversity and adaptations of organisms.

STANDARD 4: EARTH and SPACE SCIENCE

The student will apply process skills to explore and develop an understanding of the structure of the earth system, earth's history, and earth in the solar system.

STANDARD 5: SCIENCE AND TECHNOLOGY

The student will demonstrate abilities of technological design and understandings about science and technology.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES

The student will apply process skills to explore and develop an understanding of issues of personal health, population, resources and environment, and natural hazards.

STANDARD 7: HISTORY AND NATURE OF SCIENCE

The student will examine and develop an understanding of science as a historical human endeavor.

5th Grade Recommendations

Integrated	
2.1.1	▲ compares and classifies the states of matter; solids, liquids, gases, and plasma
2.2.2	▲ measures and graphs the effects of temperature on matter.
2.3.4	▲ investigates and explains how simple machines multiply force at the expense of distance.
2.4.1	understands the difference between potential and kinetic energy.
2.4.3	▲ observes and communicates how light (electromagnetic) energy interacts with matter: transmitted, reflected, refracted, and absorbed.
3.4.1	▲ recognizes that all populations living together (biotic resources) and the physical factors (abiotic resources) with which they interact compose an ecosystem.
3.4.2	understands how limiting factors determine the carrying capacity of an ecosystem.
3.4.3	▲ traces the energy flow from the sun (source of radiant energy) to producers (via photosynthesis – chemical energy) to consumers and decomposers in food webs.
4.3.1	▲ compares and contrasts the characteristics of stars, planets, moons, comets, and asteroids.
4.3.2	models spatial relationships of the earth/moon/planets/sun system to scale.
4.3.3	identifies past and present methods used to explore space.

5th Grade (Standard-Specific)

Standard 4: Earth and Space	
4.1.1	▲ identifies properties of the solid earth, the oceans and fresh water, and the atmosphere.
4.1.2	▲ models earth's cycles, constructive and destructive processes, and weather systems.
4.2.1	▲ understands that earth processes observed today (including movement of lithospheric plates and changes in atmospheric conditions) are similar to those that occurred in the past; earth history is also influenced by occasional catastrophes, such as the impact of a comet or asteroid.
4.3.1	▲ compares and contrasts the characteristics of stars, planets, moons, comets, and asteroids.
4.3.2	models spatial relationships of the earth/moon/planets/sun system to scale.
4.3.3	identifies past and present methods used to explore space.
4.4.1	▲ demonstrates and models object/space/time relationships that explain phenomena such as the day, the month, the year, seasons, phases of the moon, eclipses and tides.
4.4.2	describes how the angle of incidence of solar energy striking earth's surface affects the amount of heat energy absorbed at earth's surface.

6th Grade Recommendations

Integrated	
2.1.1	▲ compares and classifies the states of matter; solids, liquids, gases, and plasma
2.1.2	compares and contrasts the classes of matter; elements, compounds, and mixtures.
2.1.3	identifies and communicates properties of matter including but not limited to, boiling point, solubility, and density.
2.2.1	▲ understands the relationship of atoms to elements and elements to compounds. (Introduction only.)
2.2.2	▲ measures and graphs the effects of temperature on matter.
3.1.4	concludes that breakdowns in structure or function may be caused by disease, damage, heredity, or aging.
3.3.1	▲ understands that internal and/or environmental conditions affect an organism's behavior and/or response in order to maintain and regulate stable internal conditions to survive in a continually changing environment.
3.3.2	recognizes that the survival of all organisms requires the ingestion of materials, the intake and release of energy, growth, release of wastes and responses to environmental change.
3.5.2	▲ understands that adaptations of organisms (changes in structure, function, or behavior that accumulate over successive generations) contribute to biological diversity.
3.5.3	▲ associates extinction of a species with environmental changes and insufficient adaptive characteristics.
4.1.1	▲ identifies properties of the solid earth, the oceans and fresh water, and the atmosphere.
4.1.2	▲ models earth's cycles, constructive and destructive processes, and weather systems.
4.2.1	▲ understands that earth processes observed today (including movement of lithospheric plates and changes in atmospheric conditions) are similar to those that occurred in the past; earth history is also influenced by occasional catastrophes, such as the impact of a comet or asteroid.

6th Grade (Standard-Specific)

Standard 2: Physical Science	
2.1.1	▲ compares and classifies the states of matter; solids, liquids, gases, and plasma
2.1.2	compares and contrasts the classes of matter; elements, compounds, and mixtures.
2.1.3	identifies and communicates properties of matter including but not limited to, boiling point, solubility, and density.
2.2.1	▲ understands the relationship of atoms to elements and elements to compounds.
2.2.2	▲ measures and graphs the effects of temperature on matter.
2.3.1	identifies the forces that act on an object (e.g., gravity and friction)
2.3.2	▲ describes, measures, and represents data on a graph showing the motion of an object (position, direction of motion, speed).
2.3.3	▲ recognizes and describes examples of Newton's Laws of Motion.
2.3.4	▲ investigates and explains how simple machines multiply force at the expense of distance.
2.4.1	understands the difference between potential and kinetic energy.
2.4.2	▲ understands that when work is done energy transforms from one form to another, including mechanical, heat, light, sound, electrical, chemical, and nuclear energy, yet is conserved.
2.4.3	▲ observes and communicates how light (electromagnetic) energy interacts with matter: transmitted, reflected, refracted, and absorbed.
2.4.4	▲ understands that heat energy can be transferred from hot to cold by radiation, convection, and conduction.

7th Grade Recommendations

Integrated	
2.2.1	▲ understands the relationship of atoms to elements and elements to compounds.
2.3.1	identifies the forces that act on an object (e.g., gravity and friction)
2.3.2	▲ describes, measures, and represents data on a graph showing the motion of an object (position, direction of motion, speed).
2.3.3	▲ recognizes and describes examples of Newton's Laws of Motion.
2.4.2	▲ understands that when work is done energy transforms from one form to another, including mechanical, heat, light, sound, electrical, chemical, and nuclear energy, yet is conserved.
2.4.4	▲ understands that heat energy can be transferred from hot to cold by radiation, convection, and conduction.
3.1.1	▲ will understand the cell theory; that all organisms are composed of one or more cells, cells are the basic unit of life, and that cells come from other cells.
3.1.2	▲ relates the structure of cells, organs, tissues, organ systems, and whole organisms to their functions
3.1.3	compares organisms composed of single cells with organisms that are multi-cellular.
3.2.1	▲ differentiates between asexual and sexual reproduction of organisms.
3.2.2	understands how hereditary information of each cell is passed from one generation to the next.
3.2.3	infers that the characteristics of an organism result from heredity and interactions with the environment.
3.4.3	▲ traces the energy flow from the sun (source of radiant energy) to producers (via photosynthesis – chemical energy) to consumers and decomposers in food webs.
3.5.1	concludes that species of animals, plants, and microorganisms may look dissimilar on the outside but have similarities in internal structures, developmental characteristics, chemical processes, and genomes.
4.4.1	▲ demonstrates and models object/space/time relationships that explain phenomena such as the day, the month, the year, seasons, phases of the moon, eclipses and tides.
4.4.2	describes how the angle of incidence of solar energy striking earth's surface affects the amount of heat energy absorbed at earth's surface.

7th Grade (Standard-Specific)

Standard 3: Life Science	
3.1.1	▲ will understand the cell theory; that all organisms are composed of one or more cells, cells are the basic unit of life, and that cells come from other cells.
3.1.2	▲ relates the structure of cells, organs, tissues, organ systems, and whole organisms to their functions
3.1.3	compares organisms composed of single cells with organisms that are multi-cellular.
3.1.4	concludes that breakdowns in structure or function may be caused by disease, damage, heredity, or aging.
3.2.1	▲ differentiates between asexual and sexual reproduction of organisms.
3.2.2	understands how hereditary information of each cell is passed from one generation to the next
3.2.3	infers that the characteristics of an organism result from heredity and interactions with the environment
3.3.1	▲ understands that internal and/or environmental conditions affect an organism's behavior and/or response in order to maintain and regulate stable internal conditions to survive in a continually changing environment.
3.3.2	recognizes that the survival of all organisms requires the ingestion of materials, the intake and release of energy, growth, release of wastes and responses to environmental change.
3.4.1	▲ recognizes that all populations living together (biotic resources) and the physical factors (abiotic resources) with which they interact compose an ecosystem.
3.4.2	understands how limiting factors determine the carrying capacity of an ecosystem.
3.4.3	▲ traces the energy flow from the sun (source of radiant energy) to producers (via photosynthesis – chemical energy) to consumers and decomposers in food webs.
3.5.1	concludes that species of animals, plants, and microorganisms may look dissimilar on the outside but have similarities in internal structures, developmental characteristics, chemical processes, and genomes.
3.5.2	▲ understands that adaptations of organisms (changes in structure, function, or behavior that accumulate over successive generations) contribute to biological diversity.
3.5.3	▲ associates extinction of a species with environmental changes and insufficient adaptive characteristics.

Appendix III

The Kansas high school science assessment consists of two halves (Life Science and Physical Science). Both halves of the science assessment include Earth/Space Science (ESS) indicators. Since an ESS course is not available at all high schools and/or may not be a required course in all schools, an alternative for ESS standard incorporation is provided below. This alternative is an alignment of ESS standards, benchmarks, and indicators in courses beyond ESS and has been designed to ensure ESS concepts can be covered through eighth grade integrated science, biology, and physical science (physics and/or chemistry) courses. This alternative is strictly a recommendation. There are two formats of this alternative below; one with a vocabulary list and one without.

ESS Standards recommended to be taught in 8th grade/ Life Science/ Physical Science	
8th Grade	Life Science
<p>4.1.1 (Mastered) Understands constructive and destructive processes, including weathering, erosion and deposition, dynamically reshape the surface of the earth.</p> <p>a. The rock cycle describes constructive and destructive processes that change the forms of rocks and soil (solid earth).</p> <p>b. Water, glaciers, winds, waves, and gravity are weathering and erosion agents.</p>	<p>X</p>
<p>4.1.2 a, c (Mastered) ▲ Understands the theory of Plate Tectonics explains that internal energy drives the earth's ever changing structure.</p> <p>a. Movable continental and oceanic plates make up earth's surface; the hot, convecting mantle is the energy source for plate movement.</p> <p>c. Convection circulation in the mantle is driven by the outward transfer of earth's internal heat.</p>	<p>X</p>
<p>4.1.3 The ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and earth's rotation.</p> <p>a. Energy from the sun heats the oceans and the atmosphere, and drives oceanic and atmospheric circulation.</p> <p>d. Weather patterns and seasonal weather change are multi-variable phenomena.</p> <p>f. Weather in the troposphere redistributes water on the surface of the earth through the water cycle.</p> <p>i. Concepts and skills include basic weather forecasting, weather maps, fronts, pressure systems, severe storms and safety precautions.</p>	<p>4.1.3 The ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and earth's rotation.</p> <p>b. Human activity impacts global climate. Example: Burning of fossil fuels produces ground level ozone that hinders plant growth.</p> <p>c. The composition and structure of earth's atmosphere is a factor in the earth's suitability to support life.</p> <p>e. Biogeochemical cycles are an example of the integration of earth, physical, and biological science concepts.</p> <p>g. The ozone layer in the upper stratosphere filters UV radiation which is harmful to living things.</p>

	h. Gamma radiation and other high energy radiation from the sun is filtered by the upper atmosphere.
8th Grade	Life Science
<p>4.2.1 b, e ▲ Understands geological time is used to understand the earth's past.</p> <p>b. Earth changes can be short term (during a human's lifetime), such as earthquakes and volcanic eruptions, or long term (over a geological time scale), such as mountain building and plate movements.</p> <p>e. Matching coastlines, similarities in rock types, similarities in fossils and life forms suggest that today's continents are separated parts of what was long ago a single continent.</p>	<p>4.2.1 a, c, d, e ▲ Understands geological time is used to understand the earth's past.</p> <p>a. Radioactive dating and relative dating (i.e. stratigraphy, fossils) are used to estimate the time rocks were formed.</p> <p>c. The earth's atmosphere has changed over time. For example: The dramatic changes in earth's atmosphere (i.e. introduction of O₂) which were affected by the emergence of life on earth.</p> <p>d. Relates geologic evidence to a record of earth's history. Matching coastlines, similarities in rock types, similarities in fossils and life forms suggest that today's continents are separated parts of what was long ago a single continent.</p> <p>e. Matching coastlines, similarities in rock types, similarities in fossils and life forms suggest that today's continents are separated parts of what was long ago a single continent.</p>
Physical Science	
<p>4.1.2 b, d, e (Mastered) ▲ Understands the theory of Plate Tectonics explains that internal energy drives the earth's ever changing structure.</p> <p>b. Essentially all energy on earth originates with the sun, is generated by radioactive decay in earth's interior, or is left over from earth's formation.</p> <p>d. Systems on earth's surface are powered principally by the sun and contain an essentially fixed amount of each stable chemical atom or element.</p> <p>e. Rocks, water, CO₂/ O₂, carbon and other nutrients cycle through different forms as a result of cycle biological and geologic processes.</p>	
<p>4.3.1 Understands gravitational attraction of objects in the solar system keeps solar system objects in orbit.</p> <p>a. Kepler's laws describe planetary motion.</p> <p>b. Newton's laws of inertia and gravity explain orbital motion.</p> <p>c. Because of the sun's large mass, the sun is the primary gravitational force in the solar system.</p>	

4.3.2 ▲ Understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.

- a. The angle of incidence of solar energy striking earth's surface effect the amount of heat energy absorbed at earth's surface.
- b. The gravitational relationship between the earth, moon, and sun causes tides.

4.3.3 Understands the relative sizes and distances of objects in the solar system.

4.3.4 Understands the sun, earth, and other objects in the solar system formed from a nebular cloud of dust and gas.

4.4.1 ▲ Understands stellar evolution.

- a. Condensation of gases, due to gravity, is a foundation for the formation of stars
- b. The life cycle of the star begins with the nebula, which contains mostly hydrogen and helium. Heavier elements were, and continue to be, made by the nuclear fusion reactions in stars.
- c. The Hertzsprung-Russell (H-R) diagram is used to classify stars. The sun is a main sequence star.
- d. Stars are classified by their color, temperature, age, apparent brightness and distance from earth.

4.4.2 Understands the current scientific explanation of the origin and structure of the universe.

- a. The formation of the universe began with an expansion of gases from a hot, dense state. By studying the light emitted from distant galaxies, it has been found that galaxies are moving apart from one another.
- b. The red shift of light, within the Doppler effect, emitted by distance galaxies supports the conclusion that the universe is expanding.
- c. Galaxies are a level of organization of the universe. There are at least 100 billion galaxies in the observable universe. Galaxies are organized into superclusters with large voids between them.
- d. The sun is a second-generation star, which, along with our galaxy (The Milky Way which includes about 100 billion stars) formed billions of years after the Big Bang.

4.4.3 Understand how the tools of astronomy have revolutionized the study of the universe.

- a. Current telescopes can measure across the Electromagnetic-Spectrum.
- b. Spectral analysis is used to determine chemical composition and energy of stars.
- c. Relative mass of objects can be determined by observing motion of objects in space and the effect one object's gravity has on another.
- d. The tools and skills of astronomers have changed through time: ancient astronomy (Stonehenge, Greeks, Chinese, Aristotle) through modern astronomy (Copernicus to present).
- e. Astronomical tools and skills allow astronomers to research phenomena and objects that cannot be observed and measured directly.

ESS Standards recommended to be taught in 8th grade/ Life Science/ Physical Science

8th Grade	Vocabulary
<p>4.1.1 (Mastered) Understands constructive and destructive processes, including weathering, erosion and deposition, dynamically reshape the surface of the earth.</p> <p>a. The rock cycle describes constructive and destructive processes that change the forms of rocks and soil (solid earth).</p> <p>b. Water, glaciers, winds, waves, and gravity are weathering and erosion agents.</p>	<ul style="list-style-type: none"> ○ Constructive process ○ Destructive process ○ Weathering ○ Erosion ○ Deposition ○ Rock cycle
<p>4.1.2 a, c (Mastered) ▲ Understands the theory of Plate Tectonics explains that internal energy drives the earth's ever changing structure.</p> <p>a. Movable continental and oceanic plates make up earth's surface; the hot, convecting mantle is the energy source for plate movement.</p> <p>c. Convection circulation in the mantle is driven by the outward transfer of earth's internal heat.</p>	<ul style="list-style-type: none"> ○ Plate tectonics ○ Convection circulation ○ Mantle ○ Convection currents ○ Continental drift ○ Seismic activity ○ Convergent plate boundary ○ Divergent plate boundary ○ Transform or slip
<p>4.1.3 ▲ The ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and earth's rotation.</p> <p>a. Energy from the sun heats the oceans and the atmosphere, and drives oceanic and atmospheric circulation.</p> <p>d. Weather patterns and seasonal weather change are multi-variable phenomena.</p> <p>f. Weather in the troposphere redistributes water on the surface of the earth through the water cycle.</p> <p>i. Concepts and skills include basic weather forecasting, weather maps, fronts, pressure systems, severe storms and safety precautions.</p>	<ul style="list-style-type: none"> ○ Weather patterns ○ Seasons ○ Atmospheric layers ○ Fronts ○ Pressure systems

<p>4.1.4 (Mastered) * Understands the processes of water cycling through surface water (oceans, lakes, streams, glaciers), ground water (aquifers), and the atmosphere. (hydrological cycle).</p> <p>a. Processes of evaporation, condensation, precipitation, transpiration, runoff, and filtration move water through the water cycle.</p> <p>b. Weather in the troposphere redistributes water on the surface of the earth through the water cycle.</p> <p>c. Ground water is stored in aquifers and moved through underground streams.</p> <p>d. Water in the atmosphere is in the form of water vapor and clouds.</p>	<ul style="list-style-type: none"> ○ Water (hydrologic) cycle ○ Groundwater (aquifers) ○ Surface water ○ Atmosphere ○ Evaporation ○ Condensation ○ Precipitation ○ Transpiration ○ Runoff ○ Filtration
<p>4.2.1 b, e ▲ Understands geological time is used to understand the earth's past.</p> <p>b. Earth changes can be short term (during a human's lifetime), such as earthquakes and volcanic eruptions, or long term (over a geological time scale), such as mountain building and plate movements.</p> <p>e. Matching coastlines, similarities in rock types, similarities in fossils and life forms suggest that today's continents are separated parts of what was long ago a single continent.</p>	<ul style="list-style-type: none"> ○ Geological time scale
<p>Life Science</p>	<p>Vocabulary</p>
<p>4.1.3 The ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and earth's rotation.</p> <p>b. Human activity impacts global climate. Example: Burning of fossil fuels produces ground level ozone that hinders plant growth.</p> <p>c. The composition and structure of earth's atmosphere is a factor in the earth's suitability to support life.</p> <p>e. Biogeochemical cycles are an example of the integration of earth, physical, and biological science concepts.</p> <p>g. The ozone layer in the upper stratosphere filters UV radiation which is harmful to living things.</p> <p>h. Gamma radiation and other high energy radiation from the sun are filtered by the upper atmosphere.</p>	<ul style="list-style-type: none"> ○ Global climate ○ Biogeochemical cycles ○ Ozone layer

4.2.1 a, c, d, e ▲ Understands geological time is used to understand the earth's past.

a. Radioactive dating and relative dating (i.e. stratigraphy, fossils) are used to estimate the time rocks were formed.

c. The earth's atmosphere has changed over time. For example: The dramatic changes in earth's atmosphere (i.e. introduction of O₂) which were affected by the emergence of life on earth.

d. Relates geologic evidence to a record of earth's history. Matching coastlines, similarities in rock types, similarities in fossils and life forms suggest that today's continents are separated parts of what was long ago a single continent.

e. Matching coastlines, similarities in rock types, similarities in fossils and life forms suggest that today's continents are separated parts of what was long ago a single continent.

- Geologic time
- Radioactive dating
- Relative dating
- Radioactive decay
- Geological time scale
- Mass Extinction
- Glaciation
- Climatic changes
- Principle of superposition

Physical Science	Vocabulary
<p>4.1.2 b, d, e (Mastered) ▲ Understands the theory of Plate Tectonics explains that internal energy drives the earth's ever changing structure.</p> <p>b. Essentially all energy on earth originates with the sun, is generated by radioactive decay in earth's interior, or is left over from earth's formation.</p> <p>d. Systems on earth's surface are powered principally by the sun and contain an essentially fixed amount of each stable chemical atom or element.</p> <p>e. Rocks, water, CO₂/O₂, carbon and other nutrients cycle through different forms as a result of cycle biological and geologic processes.</p>	<ul style="list-style-type: none"> ○ Rock cycle ○ Water cycle ○ CO₂/O₂ cycle ○ Carbon cycle ○ Nutrient cycle ○ Radioactive decay
<p>4.3.1 Understands gravitational attraction of objects in the solar system keeps solar system objects in orbit.</p> <p>a. Kepler's laws describe planetary motion.</p> <p>b. Newton's laws of inertia and gravity explain orbital motion.</p> <p>c. Because of the sun's large mass, the sun is the primary gravitational force in the solar system.</p>	<ul style="list-style-type: none"> ○ Gravitational force ○ Kepler's Laws of Planetary Motion ○ Orbital motion
<p>4.3.2 ▲ Understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.</p> <p>a. The angle of incidence of solar energy striking earth's surface effect the amount of heat energy absorbed at earth's surface.</p> <p>b. The gravitational relationship between the earth, moon, and sun causes tides.</p>	<ul style="list-style-type: none"> ○ Seasons ○ Tides ○ Moon phases (new, crescent, waxing, waning, new, old, first, third, quarter, gibbous, full) ○ Lunar eclipse ○ Solar eclipse ○ Earth ○ Moon ○ Sun ○ Angle of incidence
<p>4.3.3 Understands the relative sizes and distances of objects in the solar system.</p>	
<p>4.3.4 Understands the sun, earth, and other objects in the solar system formed from a nebular cloud of dust and gas.</p>	

<p>4.4.1 ▲ Understands stellar evolution.</p> <p>a. Condensation of gases, due to gravity, is a foundation for the formation of stars</p> <p>b. The life cycle of the star begins with the nebula, which contains mostly hydrogen and helium. Heavier elements were, and continue to be, made by the nuclear fusion reactions in stars.</p> <p>c. The Hertzsprung-Russell (H-R) diagram is used to classify stars. The sun is a main sequence star.</p> <p>d. Stars are classified by their color, temperature, age, apparent brightness and distance from earth.</p>	<ul style="list-style-type: none"> ○ Stellar evolution ○ Nebula ○ Hertzsprung-Russell (H-R) diagram ○ Brightness – apparent ○ Nuclear fusion ○ Main sequence ○ Giants ○ Dwarfs
<p>4.4.2 Understands the current scientific explanation of the origin and structure of the universe.</p> <p>a. The formation of the universe began with an expansion of gases from a hot, dense state. By studying the light emitted from distant galaxies, it has been found that galaxies are moving apart from one another.</p> <p>b. The red shift of light, within the Doppler effect, emitted by distance galaxies supports the conclusion that the universe is expanding.</p> <p>c. Galaxies are a level of organization of the universe. There are at least 100 billion galaxies in the observable universe. Galaxies are organized into superclusters with large voids between them.</p> <p>d. The sun is a second-generation star, which, along with our galaxy (The Milky Way which includes about 100 billion stars) formed billions of years after the Big Bang.</p>	<ul style="list-style-type: none"> ○ Doppler Effect ○ Red shift ○ Clusters ○ Superclusters ○ Levels of organization (sun, solar system, galaxy, cluster, supercluster, universe) ○ Big Bang theory
<p>4.4.3 Understand how the tools of astronomy have revolutionized the study of the universe.</p> <p>a. Current telescopes can measure across the Electromagnetic-Spectrum.</p> <p>b. Spectral analysis is used to determine chemical composition and energy of stars.</p> <p>c. Relative mass of objects can be determined by observing motion of objects in space and the effect one object's gravity has on another.</p> <p>d. The tools and skills of astronomers have changed through time: ancient astronomy (Stonehenge, Greeks, Chinese, Aristotle) through modern astronomy (Copernicus to present).</p> <p>e. Astronomical tools and skills allow astronomers to research phenomena and objects that cannot be observed and measured directly.</p>	<ul style="list-style-type: none"> ○ Telescope ○ Spectral analysis ○ Galaxies ○ Electromagnetic-Spectrum ○ Space shuttle ○ Space probe ○ Space station