

**Nebraska Science Standards
Heartland Community School
Kindergarten**

1.1 Unifying Concepts and Processes

1.8.1 By the end of first grade, students will develop an understanding of systems, order, and organization.

- TLW classify objects by different attributes
- TLW describe attributes of objects
- TLW count and graph assorted objects

1.1.2 By the end of first grade, students will develop an understanding of evidence, models, and explanation.

1.8.1 By the end of first grade, students will develop an understanding of change, constancy, and measurement.

- TLW compare two or more objects using various units of measurement

1.1.4 By the end of first grade, students will develop an understanding of form and function.

- TLW identify specific instruments needed to complete project.
- TLW observe changes of matter when heat energy is applied

1.2 Science as Inquiry

1.2.1 By the end of first grade, students will develop the abilities needed to do scientific inquiry.

- TLW plan and conduct a simple investigation using scientific method

1.3 Physical Science

1.3.1 By the end of first grade, students will develop an understanding of the characteristics of materials.

- TLW differentiate properties of common materials

1.4 Life Science

1.4.1 By the end of first grade, students will develop an understanding of the characteristics of living things

- 1.4.2 By the end of first grade, students will develop an understanding of the life cycles of organisms.
- TLW observe and order the growth sequence of living things

1.5 Earth and Space Science

- 1.8.1 By the end of first grade, students will develop an understanding of characteristics of earth materials.
- THW observe and differentiate earth materials
- 1.5.2 By the end of first grade, students will develop an understanding of the objects in the sky.
- 1.8.2 By the end of first grade, students will develop an understanding of the changes in the earth and sky.
- TLW observe environmental changes and relate information to people and animals

1.6 Science and Technology

- 1.6.1 By the end of first grade, students will develop an understanding of technological design.
- 1.8.3 By the end of first grade, students will develop an understanding of science and technology.
- TLW investigate and utilize scientific instruments to extend the senses

1.7 Science in Personal and Social Perspectives

- 1.7.1 By the end of first grade, students will develop an understanding of personal health.
- TLW identify environmental rules for personal safety
- 1.7.2 By the end of first grade, students will develop an understanding of resources.
- TLW observe and describe factors that help the environment

1.8 History and Nature of Science

- 1.8.4 By the end of first grade, students will develop an understanding of science as a human endeavor.

First Grade

1.1 Unifying Concepts and Processes

1.1.1 By the end of first grade, students will develop an understanding of systems, order, and organization.

- TLW investigate using their five senses, growth, development and needs of living organisms
- TLW explore their own five senses and utilize these to problem solve, interpret data, collect information, & investigate their environment.
- TLW will investigate the similarities and differences among living organisms found in their environments.

1.1.2 By the end of first grade, students will develop an understanding of evidence, models, and explanation.

- TLW create and arrange a series of events in chronological order
- TLW interpret and/or organize information presented on a graph

1.1.3 By the end of first grade, students will develop an understanding of change, constancy, and measurement.

- TLW use appropriate measurement systems to compare, contrast and record information..

1.1.4 By the end of first grade, students will develop an understanding of form and function.

- TLW relate how living things interact with their environment because of specific characteristics.

1.2 Science as Inquiry

1.2.1 By the end of first grade, students will develop the abilities needed to do scientific inquiry.

- TLW will collect scientific information and organize data implementing the scientific method and using appropriate equipment.

1.3 Physical Science

1.3.1 By the end of first grade, students will develop an understanding of the characteristics of materials.

- TLW observe and compare the characteristics and properties of different materials.

1.4 Life Science

1.4.1 By the end of first grade, students will develop an understanding of the characteristics of living things.

- TLW differentiate between living and nonliving things and justify necessary elements for survival.
- TLW compare and contrast animals by specific characteristics
- TLW observe and recognize that organisms live and survive in distinct habitats.

1.4.2 By the end of first grade, students will develop an understanding of the life cycles of organisms.

- TLW relate how living things grow and change

1.5 Earth and Space Science

1.5.1 By the end of first grade, students will develop an understanding of characteristics of earth materials.

1.5.2 By the end of first grade, students will develop an understanding of the objects in the sky.

- TLW observe and recognize objects in the sky such as sun, moon and stars
- TLW Apply the properties of the sun to survival

1.5.3 By the end of first grade, students will develop an understanding of the changes in the earth and sky.

- TLW analyze and record daily and seasonal weather changes

1.6 Science and Technology

1.6.1 By the end of first grade, students will develop an understanding of technological design.

- TLW Identify the tool used for common first grade jobs

1.6.2 By the end of first grade, students will develop an understanding of science and technology.

- TLW will implement various tools, such as microscope, magnifying glass, thermometer, measuring tape, etc to improve observation and measurement.

1.7 Science in Personal and Social Perspectives

1.7.1 By the end of first grade, students will develop an understanding of personal health

- TLW verbalize and illustrate safety rules for school.
- TLW will evaluate the need for proper dental hygiene
- By the end of first grade, students will develop an understanding of resources.

1.8 History and Nature of Science

1.8.1 By the end of first grade, students will develop an understanding of science as a human endeavor.

- TLW identify the contributions to science and its related fields made by men and women.

Second Grade

4.1 Unifying Concepts and Processes

4.1.1 By the end of fourth grade, students will develop an understanding of systems, order, and organization.

-Describe the parts that make up the circulatory and digestive systems.

4.1.2 By the end of fourth grade, students will develop an understanding of evidence, models and explanation.

-Label the parts of the human body.

4.1.3 By the end of fourth grade, students will develop an understanding of change, constancy, and measurement.

-Measure and record the growth of a plant.

4.1.4 By the end of fourth grade, students will develop an understanding of form and function.

4.2 Science As Inquiry

4.2.1 By the end of fourth grade, students will develop the abilities needed to do scientific inquiry.

-Observe and compare plants using the basic needs as variables (water, light, and soil).

4.3 Physical Science

4.3.1 By the end of fourth grade, students will develop an understanding of the characteristics of objects and materials.

-Use hand lens to observe objects.

-Record daily temperature.

- 4.3.2 By the end of fourth grade, students will develop an understanding of the position and motion of objects.

-Identify the properties of sound.

- Demonstrate how sound is produced when objects vibrate.

-Demonstrate and explain a self-created musical instrument.

- 4.3.3 By the end of fourth grade, students will develop an understanding of light, heat, electricity, and magnetism.

-Identify the properties of light.

-Observe and record how prisms separate light.

-Identify materials that are translucent, transparent and opaque.

-Name materials that are good reflectors of light.

-Describe the physical properties of magnets.

-Use electricity to produce magnetic effects.

4.4 Life Science

- 4.4.1 By the end of fourth grade, students will develop an understanding of the characteristics of living things.

-Identify the various structures of plants necessary for growth, survival, and reproduction (seed, roots, stem, and leaves).

-Identify three parts of a seed.

-Identify the basic needs of a plant.

-Identify the characteristics of amphibians, insects and dinosaurs.

- 4.4.2 By the end of fourth grade, students will develop an understanding of the life cycles of living things.

-Illustrate and label the life cycle of a frog and butterfly.

- 4.4.3 By the end of fourth grade, students will develop an understanding of living things and environments.

4.5 Earth and Space Science

- 4.5.1 By the end of fourth grade, students will develop an understanding of the characteristics of earth materials.

- 4.5.2 By the end of fourth grade, students will develop an understanding of objects in the sky.

- 4.5.3 By the end of fourth grade, students will develop an understanding of the changes in the earth and sky.

-Describe an ancient environment based on fossil evidence.

4.6 Science and Technology

- 4.6.1 By the end of fourth grade, students will develop an understanding of technological design.
- 4.6.2 By the end of fourth grade, students will develop an understanding of science and technology.
- 4.6.3 By the end of fourth grade, students will develop an understanding of the abilities to distinguish between natural objects and objects made by humans.

4.7 Science in Personal and Social Perspectives

- 4.7.1 By the end of fourth grade, students will develop an understanding of personal health.
- Name the food groups and identify foods that belong in each group.
- Describe how different substances, such as tobacco, alcohol, and drugs, can damage the body and alter how it functions.
- Demonstrate fire safety procedures
- 4.7.2 By the end of fourth grade, students will develop an understanding of the types of resources.
- 4.7.3 By the end of fourth grade, students will develop an understanding of environmental changes.
- 4.7.4 By the end of fourth grade, students will develop an understanding of how science and technology helps communities resolve problems.

4.8 History and Nature of Science

- 4.8.1 By the end of fourth grade, students will develop an understanding of science as a human endeavor.

Third Grade

4.1 Unifying Concepts and Processes

- 4.1.1 By the end of fourth grade, students will develop an understanding of systems, order, and organization.
 - TLW explain the water cycle and the forming of clouds.
 - TLW identify different cloud formations.
- 4.1.2 By the end of fourth grade, students will develop an understanding of evidence, models and explanation.
 - TLW name and describe the four layers of the earth.
 - TLW create a machine.
 - TLW identify, label, and correctly organize a model of the water cycle.
- 4.1.3 By the end of fourth grade, students will develop an understanding of change, constancy, and measurement.
 - TLW use a balance scale to weigh and quantify objects.
 - TLW use linear measure to determine the size or height.
 - TLW illustrate and explain the physical change occurring from one state to another.
 - TLW explain how rocks are weathered and identify causes of weathering.
 - TLW explain how soil erosion can be reduced and prevented.
- 4.1.4 By the end of fourth grade, students will develop an understanding of form and function.
 - TLW create a machine.
 - TLW explain and describe the created machine through a presentation.

4.2 Science As Inquiry

- 4.2.1 By the end of fourth grade, students will develop the abilities needed to do scientific inquiry.
 - TLW design and perform two long-term experiments appropriate to grade level. (apples, cranberries)
 - TLW demonstrate the approved steps of scientific methods.

4.3 Physical Science

- 4.3.1 By the end of fourth grade, students will develop an understanding of the characteristics of objects and materials.
 - TLW describe the three states of matter and give examples of each.
 - TLW participate in experiments to observe, predict, and describe the characteristics of matter.
 - TLW use a balance scale to weigh and quantify objects.
 - TLW use linear measure to determine the size or height.
 - TLW illustrate and explain the physical change occurring from one state to another.
- 4.3.2 By the end of fourth grade, students will develop an understanding of the position and motion of objects.
 - TLW demonstrate pushing and pulling motion.
 - TLW explain which surface produces the least and most friction.
- 4.3.3 By the end of fourth grade, students will develop an understanding of light, heat, electricity, and magnetism.

4.4 Life Science

4.4.1 By the end of fourth grade, students will develop an understanding of the characteristics of living things.

- TLW describe the classification systems for animal kingdoms.
- TLW compare and contrast likenesses and differences of animal kingdom classifications.
- TLW construct a food chain.

4.4.2 By the end of fourth grade, students will develop an understanding of the life cycles of living things.

4.4.3 By the end of fourth grade, students will develop an understanding of living things and environments.

- TLW identify and explain the characteristics of animal habitats.
- TLW explain how humans impact animal habitats.
- TLW explain the relationship that exists between prey and predator.
- TLW identify the predator and prey in a food chain.

4.5 Earth and Space Science

4.5.1 By the end of fourth grade, students will develop an understanding of the characteristics of earth materials.

- TLW identify some uses of rocks.
- TLW retell different ways fossils are made.
- TLW state the three main groups of rocks: igneous, metamorphic, and sedimentary.

4.5.2 By the end of fourth grade, students will develop an understanding of objects in the sky.

- TLW explain the water cycle and the forming of clouds.
- TLW identify different cloud formations.

4.5.3 By the end of fourth grade, students will develop an understanding of the changes in the earth and sky.

- TLW explain how rocks are weathered and identify causes of weathering.
- TLW explain how soil erosion can be reduced and prevented.

4.6 Science and Technology

4.6.1 By the end of fourth grade, students will develop an understanding of technological design.

- TLW identify a simple problem and create a solution to the problem.
- TLW demonstrate the solution.
- TLW evaluate and communicate the problem, design, and solution.

4.6.2 By the end of fourth grade, students will develop an understanding of science and technology.

4.6.3 By the end of fourth grade, students will develop an understanding of the abilities to distinguish between natural objects and objects made by humans.

- TLW distinguish between a natural and manufactured object.

4.7 Science in Personal and Social Perspectives

- 4.7.1 By the end of fourth grade, students will develop an understanding of personal health.
- TLW summarize the dangers of different drugs to the health of the body.
 - TLW participate and demonstrate fire prevention measures.
- 4.7.2 By the end of fourth grade, students will develop an understanding of the types of resources.
- TLW list examples and conservation of natural resources.
- 4.7.3 By the end of fourth grade, students will develop an understanding of environmental changes.
- TLW explain how rocks are weathered and identify causes of weathering.
 - TLW explain how soil erosion can be reduced and prevented.
- 4.7.4 By the end of fourth grade, students will develop an understanding of how science and technology helps communities resolve problems.

4.8 History and Nature of Science

- 4.8.1 By the end of fourth grade, students will develop an understanding of science as a human endeavor.
- TLW identify inventors with their inventions.

Fourth Grade

4.1 Unifying Concepts and Processes

- 4.1.1 By the end of fourth grade, students will develop an understanding of systems, order, and organization.
- TLW identify and categorize resources available to Nebraskans in the past and present and predict resources available to Nebraskans in the future.
 - TLW research and describe how living creatures in Nebraska have or have not adapted to their environmental conditions.
 - TLW evaluate the effects of habitat destruction and resources on diversity.
 - TLW compare similarities of parents and offspring and distinguish between inherited and learned likenesses.
 - TLW gather data and categorize the components of a Nebraska prairie.
 - TLW analyze the food web of a Nebraska wild animal.
 - TLW identify, label, and correctly arrange the planets of our solar system.
- 4.1.2 By the end of fourth grade, students will develop an understanding of evidence, models and explanation.
- TLW measure and compare different plants and their parts.
 - Through the inquiry research method, TLW create questions, predict, gather data, experiment, draw conclusions, create visuals, and present their learning to others.

- TLW label a visual diagram demonstrating their understanding of the components of our solar system.
- 4.1.3 By the end of fourth grade, students will develop an understanding of change, constancy, and measurement.
 - TLW describe observable physical changes in rocks and/or minerals due to environmental effects.
- 4.1.4 By the end of fourth grade, students will develop an understanding of form and function.
 - TLW construct a battery circuit to light a bulb.

4.2 Science As Inquiry

- 4.2.1 By the end of fourth grade, students will develop the abilities needed to do scientific inquiry.
 - Through the inquiry research method, TLW create questions, predict, gather data, experiment, draw conclusions, create visuals, and present their learning to others.

4.3 Physical Science

- 4.3.1 By the end of fourth grade, students will develop an understanding of the characteristics of objects and materials.
 - TLW observe and identify different characteristics of a variety of plants, using scientific tools.
- 4.3.2 By the end of fourth grade, students will develop an understanding of the position and motion of objects.
 - TLW label a visual diagram demonstrating their understanding of the components of our solar system.
 - TLW identify, label, and correctly arrange the planets of our solar system.
 - TLW identify and diagram the orbits of the planets in our solar system.
- 4.3.3 By the end of fourth grade, students will develop an understanding of light, heat, electricity, and magnetism.
 - TLW identify types of magnets and their properties.
 - TLW differentiate between two kinds of electricity, static and current.

4.4 Life Science

- 4.4.1 By the end of fourth grade, students will develop an understanding of the characteristics of living things.
 - TLW explain, describe, and/or illustrate the characteristics of living things.
- 4.4.2 By the end of fourth grade, students will develop an understanding of the life cycles of living things.
 - TLW explain, describe, and/or illustrate the life cycle of a plant or animal.
- 4.4.3 By the end of fourth grade, students will develop an understanding of living things and environments.

- TLW explain, describe, and/or illustrate the effects of living things related to their environment.
- TLW analyze the food web of a Nebraska wild animal.
- TLW evaluate the effects of habitat destruction and resources on diversity

4.5 Earth and Space Science

- 4.5.1 By the end of fourth grade, students will develop an understanding of the characteristics of earth materials.
- TLW describe characteristics of rocks and minerals.
 - TLW classify rocks by properties.
- 4.5.2 By the end of fourth grade, students will develop an understanding of objects in the sky.
- TLW identify, label, and correctly arrange the planets of our solar system.
 - TLW identify and diagram the orbits of the planets in our solar system.
- 4.5.3 By the end of fourth grade, students will develop an understanding of the changes in the earth and sky.
- TLW identify the characteristics of rocks and their formation related to changes in the environment.
 - TLW relate changes of a natural prairie to environmental influences.

4.6 Science and Technology

- 4.6.1 By the end of fourth grade, students will develop an understanding of technological design.
- TLW research technological advances which have influenced Nebraska's past, present, and future.
- 4.6.2 By the end of fourth grade, students will develop an understanding of science and technology.
- Through the inquiry research method, TLW create questions, predict, gather data, experiment, create visuals, and present their learning to others.
- 4.6.3 By the end of fourth grade, students will develop an understanding of the abilities to distinguish between natural objects and objects made by humans.

4.7 Science in Personal and Social Perspectives

- 4.7.1 By the end of fourth grade, students will develop an understanding of personal health.
- TLW develop an understanding of the dangers of different drugs and how they can damage the body and alter its functions.
- 4.7.2 By the end of fourth grade, students will develop an understanding of the types of resources.
- Through inquiry research, TLW discover and describe specific resources necessary for plant survival.

- TLW explain, describe, and/or illustrate the importance of tangible and intangible resources relating to the migration of the Sandhill cranes and Nebraska.
 - TLW explain, describe, and/or illustrate the tangible and intangible resources of a natural prairie.
- 4.7.3 By the end of fourth grade, students will develop an understanding of environmental changes.
- TLW distinguish between natural environmental changes and human influenced environmental changes in relation to a natural prairie, rocks, or wildlife.
- 4.7.4 By the end of fourth grade, students will develop an understanding of how science and technology helps communities resolve problems.
- TLW research technological advances which have influenced the settling of Nebraska and its communities.

4.8 History and Nature of Science

- 4.8.1 By the end of fourth grade, students will develop an understanding of science as a human endeavor.
- TLW research different contributions of men and women scientists throughout history.

Fifth Grade

8.1 Unifying Concepts and Processes

- 8.8.3 By the end of eighth grade, students will develop an understanding of systems, order, and organization.
- TLW create and use classification schemes
- 8.8.4 By the end of eighth grade, students will develop an understanding of evidence, models, and explanation.
- TLW collect, manipulate and analyze data from an experiment
 - TLW observe and develop models
- 8.1.3 By the end of eighth grade, students will develop an understanding of change, constancy, and measurement.
- TLW select and use appropriate measurement systems
- 8.1.4 By the end of eighth grade, students will develop an understanding of form and function.
- TLW demonstrate how the design of an object makes it possible to perform a specialized task

8.2 Science as Inquiry

- 8.2.1 By the end of eighth grade, students will develop the abilities needed to do scientific inquiry.
- TLW identify questions and form hypotheses that can be examined through scientific investigations
 - TLW use appropriate tools and techniques to gather, analyze and interpret data
 - TLW develop descriptions, explanations, predictions, and models using evidence
 - TLW use mathematics in all aspects of scientific inquiry

8.3 Physical Science

- 8.3.1 By the end of eighth grade, students will develop an understanding of properties and changes of properties in matter.
- TLW investigate and demonstrate that characteristic properties, such as density, boiling point and solubility of substances, are not dependent on the quantity of the substance
 - TLW observe, describe and measure physical and chemical properties of matter
 - TLW define properties of solids, liquids and gases
 - TLW relate that all matter is composed of elements which may combine in a variety of ways to form compounds
 - TLW list differences between elements, molecules, compounds, mixtures, solutions and suspensions
 - TLW demonstrate examples of melting and boiling
 - TLW draw simple diagrams of an atom including its three main parts
- 8.3.2 By the end of eighth grade, students will develop an understanding of motion and forces.
- 8.3.3 By the end of eighth grade, students will develop an understanding of the transfer of energy.

8.4 Life Science

- 8.8.3 By the end of eighth grade, students will develop an understanding of the structure and function in living systems.
- TLW classify vertebrates and invertebrates into categories by body characteristics
 - TLW identify the six main groups of invertebrates
 - TLW identify the five main groups of vertebrates
 - TLW compare and contrast vertebrates and invertebrates

- 8.4.2 By the end of eighth grade, students will develop an understanding of reproduction and heredity.
- 8.4.3 By the end of eighth grade, students will develop an understanding of regulation and behavior.
- 8.4.4 By the end of eighth grade, students will develop an understanding of populations and ecosystems.
- 8.4.5 By the end of eighth grade, students will develop an understanding of diversity and adaptations of organisms.

8.5 Earth and Space Science

- 8.5.1 By the end of eighth grade, students will develop an understanding of the structure of the earth.
- 8.5.2 By the end of eighth grade, students will develop an understanding of the earth's history.
- 8.5.3 By the end of eighth grade, students will develop an understanding of the earth in the solar system.

8.6 Science and Technology

- 8.6.1 By the end of eighth grade, students will develop an understanding of technological design.
-Design a model of a machine to perform a selected function
- 8.6.2 By the end of eighth grade, students will develop an understanding of science and technology.

8.7 Science in Personal and Social Perspectives

- 8.7.1 By the end of eighth grade, students will develop an understanding of personal health
-TLW state the basic health rules necessary for staying healthy as appropriate to grade level
-TLW read and explain parts of food nutrition labels
-TLW explain methods of and reasons for restricting fat, sugar, and sodium
- 8.7.2 By the end of eighth grade, students will develop an understanding of populations, resources, and environments.

- TLW define natural and renewable resources
- TLW classify resources as natural, renewable or nonrenewable
- TLW describe examples and sources of air, water and land pollution
- TLW describe common types of recycling currently in practice
- 8.7.3 By the end of eighth grade, students will develop an understanding of natural hazards.
- 8.7.4 By the end of eighth grade, students will develop an understanding of risks and benefits.
- 8.7.5 By the end of eighth grade, students will develop an understanding of science and technology in society.

8.8 History and Nature of Science

- 8.8.1 By the end of eighth grade, students will develop an understanding of science as a human endeavor.
- 8.8.2 By the end of eighth grade, students will develop an understanding of the nature of science.
- 8.8.3 By the end of eighth grade, students will develop an understanding of the history of science.

Sixth Grade

8.1 Unifying Concepts and Processes

- 8.1.1 By the end of eighth grade, students will develop an understanding of systems, order, and organization.
 - TLW investigate and describe the human body systems and how they interact (skeletal, muscular, cardiovascular, respiratory, nervous, endocrine, excretory)
- 8.1.2 By the end of eighth grade, students will develop an understanding of evidence, models, and explanation.
 - TLW collect, manipulate, and analyze data from an experiment
 - TLW observe and develop models
 - TLW interpret and explain results of experimentation
- 8.1.3 By the end of eighth grade, students will develop an understanding of change, constancy, and measurement.
 - TLW select and use appropriate measurement units
 - TLW apply English and metric systems of measurements

- TLW identify and use the SI units of length, volume, mass, and temperature
- 8.1.4 By the end of eighth grade, students will develop an understanding of form and function.
 - TLW demonstrate how the design of simple machines makes it possible for them to perform their specialized tasks.

8.2 Science as Inquiry

- 8.2.1 By the end of eighth grade, students will develop the abilities needed to do scientific inquiry.
 - TLW identify questions and form hypotheses that can be examined through scientific investigations
 - TLW design and conduct a scientific investigation
 - TLW use appropriate tools and techniques to gather, analyze, and interpret data
 - TLW communicate scientific procedures and explanations

8.3 Physical Science

- 8.3.1 By the end of eighth grade, students will develop an understanding of properties and changes of properties in matter.
 - TLW distinguish between physical and chemical properties of matter
 - TLW provide examples of how physical and chemical changes affect the world you live in
 - TLW explain that all matter is composed of elements which may combine in a variety of ways to form compounds
- 8.3.2 By the end of eighth grade, students will develop an understanding of motion and forces.
 - TLW demonstrate how to measure speed, velocity, and acceleration
 - TLW describe gravity and explain the influence it has on objects
 - TLW describe what forces are and how they act
 - TLW distinguish between mass and weight
 - TLW explain the effect friction has on objects
 - TLW investigate and describe how Newton's laws are used to understand motion
- 8.3.3 By the end of eighth grade, students will develop an understanding of the transfer of energy.
 - TLW define energy and describe the various forms it can take
 - TLW distinguish between potential energy and kinetic energy
 - TLW investigate the law of conservation energy
 - TLW define work and describe how it is calculated
 - TLW investigate and describe the types of simple machines and how they make work easier
 - TLW indicate which pairs of charges will repel and which will attract
 - TLW differentiate between conductors and insulators

-TLW distinguish between series and parallel circuits

8.4 Life Science

- 8.4.1 By the end of eighth grade, students will develop an understanding of the structure and function in living systems.
- TLW identify the major tissues found in the body
 - TLW compare an organ with an organ system
 - TLW investigate and describe the human body systems and how they interact (skeletal, muscular, cardiovascular, respiratory, nervous, endocrine, excretory)
 - TLW investigate and explain how disease affects the structure and/or function of an organism
- 8.4.2 By the end of eighth grade, students will develop an understanding of reproduction and heredity.
- 8.4.3 By the end of eighth grade, students will develop an understanding of regulation and behavior.
- 8.4.4 By the end of eighth grade, students will develop an understanding of populations and ecosystems.
- 8.4.5 By the end of eighth grade, students will develop an understanding of diversity and adaptations of organisms.

8.5 Earth and Space Science

- 8.5.1 By the end of eighth grade, students will develop an understanding of the structure of the earth.
- 8.5.2 By the end of eighth grade, students will develop an understanding of the earth's history.
- 8.5.3 By the end of eighth grade, students will develop an understanding of the earth in the solar system.

8.6 Science and Technology

- 8.6.1 By the end of eighth grade, students will develop an understanding of technological design.
- TLW design a car, carrying an egg as a passenger, that is able to withstand crashes
 - TLW design a straw structure

- 8.6.2 By the end of eighth grade, students will develop an understanding of science and technology.

-TLW describe how science and technology are related

8.7 Science in Personal and Social Perspectives

- 8.7.1 By the end of eighth grade, students will develop an understanding of personal health

- 8.8.3 By the end of eighth grade, students will develop an understanding of populations, resources, and environments.

-TLW investigate and describe how population levels affect resources and the environment

-TLW explain the importance of conservation

-TLW describe the three Rs (reduce, reuse, recycle) and their importance

-TLW explain how habitats can be protected

-TLW identify the major types of pollution

-TLW distinguish between renewable and nonrenewable resources

- 8.7.3 By the end of eighth grade, students will develop an understanding of natural hazards.

-TLW investigate and describe human activities (urban growth, land use, waste disposal) which can accelerate many natural changes

- 8.7.4 By the end of eighth grade, students will develop an understanding of risks and benefits.

- 8.7.5 By the end of eighth grade, students will develop an understanding of science and technology in society.

8.8 History and Nature of Science

- 8.8.1 By the end of eighth grade, students will develop an understanding of science as a human endeavor.

- 8.8.2 By the end of eighth grade, students will develop an understanding of the nature of science.

- 8.8.3 By the end of eighth grade, students will develop an understanding of the history of science.

Seventh Grade

8.1 Unifying Concepts and Processes

- 8.1.1 By the end of eighth grade, students will develop an understanding of systems, order, and organization.
- TLW give examples that show the need for classification systems
 - TLW list the seven levels of classification
 - TLW list the reasons scientific names are more useful to scientists than common names
 - TLW explain how scientific names are written
 - TLW demonstrate how to create and use a dichotomous key
 - TLW list the five kingdoms and describe their characteristics and members
 - TLW describe the numerous invertebrate phyla and give examples of each phyla
 - TLW investigate and describe the chordata phylum and give examples of the different classes
- 8.1.2 By the end of eighth grade, students will develop an understanding of evidence, models, and explanation.
- TLW collect, manipulate, and analyze data from an experiment
 - TLW observe and develop models
 - TLW interpret and explain information in tables and graphs
 - TLW interpret and explain results of experimentation
 - TLW analyze whether or not conclusions are reasonable
- 8.1.3 By the end of eighth grade, students will develop an understanding of change, constancy, and measurement.
- TLW select and use appropriate measurement units
 - TLW identify and use the SI units of length, volume, mass, and temperature
- 8.1.4 By the end of eighth grade, students will develop an understanding of form and function.
- TLW explain how the structure of a leaf is related to its function
 - TWL explain how the structure of cells is related to their function
 - TLW explain how the structure of a bird's wing is related to its function

8.2 Science as Inquiry

- 8.2.1 By the end of eighth grade, students will develop the abilities needed to do scientific inquiry.
- TLW identify questions and form hypotheses that can be examined through scientific investigations
 - TLW design and conduct a scientific investigation
 - TLW use appropriate tools and techniques to gather, analyze, and interpret data
 - TLW develop descriptions, explanations, prediction, and models using evidence and explanations
 - TLW communicate scientific procedures and explanations
 - TLW use mathematics in scientific inquiry

8.3 Physical Science

- 8.3.1 By the end of eighth grade, students will develop an understanding of properties and changes of properties in matter.
- 8.3.2 By the end of eighth grade, students will develop an understanding of motion and forces.
- 8.3.3 By the end of eighth grade, students will develop an understanding of the transfer of energy.

8.4 Life Science

- 8.4.1 By the end of eighth grade, students will develop an understanding of the structure and function in living systems.
 - TLW explain how life is organized, from a single cell to an ecosystem
 - TLW describe the difference between unicellular and multicellular organisms
 - TWL differentiate between prokaryotic and eukaryotic cells
 - TWL differentiate between animal cells and plant cells
 - TLW investigate and explain how cells sustain life through functions (e.g. diffusion, osmosis, photosynthesis, cellular respiration, fermentation, cell division)
 - TLW explain how cell division differs in plants and animals
- 8.4.2 By the end of eighth grade, students will develop an understanding of reproduction and heredity.
 - TLW distinguish between asexual reproduction and sexual reproduction
 - TLW explain how traits are inherited
 - TLW explain how genes and alleles are related to genotypes and phenotypes
 - TLW use a Punnett square to predict the results of crosses
 - TLW investigate and determine how genetic disorders are caused
 - TLW explain the inheritance of sex-linked traits
- 8.4.3 By the end of eighth grade, students will develop an understanding of regulation and behavior.
 - TLW differentiate between different animal behaviors (e.g. producer, consumer, decomposer)
 - TLW list the advantages and disadvantages of living in groups
 - TLW explain the relationship between stimuli and tropisms in plants
- 8.4.4 By the end of eighth grade, students will develop an understanding of populations and ecosystems.
 - TLW distinguish between the biotic and abiotic environment

- TLW explain how populations, communities, ecosystems, and the biosphere are related
- TLW describe an organism by the function it serves in an ecosystem (e.g. producer, consumer, decomposer)
- TLW investigate and analyze the living and nonliving factors that determine the number of organisms an ecosystem can support
- TLW differentiate between a food chain and a food web
- TLW distinguish between an organism's habitat and its niche
- TLW explain how energy flows through a food web

- and 8.4.5 By the end of eighth grade, students will develop an understanding of diversity adaptations of organisms.
- TLW describe Earth's major biomes
 - TLW outline the process of speciation
 - TWL explain the importance of variations in organisms
 - TLW define extinction and identify some major causes of extinction
 - TLW identify the adaptations birds have for flight
 - TLW explain the adaptations that allow reptiles to live on land
 - TLW describe the adaptations amphibians have for living in water and on land

8.5 Earth and Space Science

- 8.5.1 By the end of eighth grade, students will develop an understanding of the structure of the earth.
- 8.5.2 By the end of eighth grade, students will develop an understanding of the earth's history.
- 8.5.3 By the end of eighth grade, students will develop an understanding of the earth in the solar system.

8.6 Science and Technology

- 8.6.1 By the end of eighth grade, students will develop an understanding of technological design.
- TLW design a vehicle that will house an egg and will allow the egg to live when dropped from a height of two meters
- 8.6.2 By the end of eighth grade, students will develop an understanding of science and technology.

8.7 Science in Personal and Social Perspectives

- 8.7.1 By the end of eighth grade, students will develop an understanding of personal health
- 8.7.2 By the end of eighth grade, students will develop an understanding of populations, resources, and environments.
 - TLW explain how habitat destruction affects organisms
 - TLW explain the impact of human population growth
- 8.7.3 By the end of eighth grade, students will develop an understanding of natural hazards.
 - TLW investigate and describe the effect of natural hazards on the environment
- 8.7.4 By the end of eighth grade, students will develop an understanding of risks and benefits.
- 8.7.5 By the end of eighth grade, students will develop an understanding of science and technology in society.

8.8 History and Nature of Science

- 8.8.1 By the end of eighth grade, students will develop an understanding of science as a human endeavor.
- 8.8.2 By the end of eighth grade, students will develop an understanding of the nature of science.
 - TLW formulate and test a hypothesis using observations, experiments, and models
 - TLW evaluate the results of scientific investigations, experiments, observations, and the explanations proposed by other scientists
- 8.8.3 By the end of eighth grade, students will develop an understanding of the history of science.
 - TLW explain Mendel's role in the history of genetics
 - TLW compare and contrast Aristotle's and Linnaeus's systems of classification

Eighth Grade

8.1 Unifying Concepts and Processes

- 8.1.1 By the end of eighth grade, students will develop an understanding of systems, order, and organization.
 - TLW recognize and describe the key components of the solar system

-TLW use classification keys to classify minerals and rocks

8.1.2 By the end of eighth grade, students will develop an understanding of evidence, models, and explanation.

- TLW collect, manipulate, and analyze data from an experiment
- TLW observe and develop models
- TLW interpret and explain information in tables and graphs
- TLW interpret and explain results of experimentation
- TLW analyze whether or not conclusions are reasonable

8.1.3 By the end of eighth grade, students will develop an understanding of change, constancy, and measurement.

- TLW select and use appropriate measurement units
- TLW identify and use the SI units of length, volume, mass, and temperature

8.1.4 By the end of eighth grade, students will develop an understanding of form and function.

- TLW demonstrate how the design of a rocket makes it possible for flight

8.2 Science as Inquiry

8.2.1 By the end of eighth grade, students will develop the abilities needed to do scientific inquiry.

- TLW identify questions and form hypotheses that can be examined through scientific investigations
- TLW design and conduct a scientific investigation
- TLW use appropriate tools and techniques to gather, analyze, and interpret data
- TLW develop descriptions, explanations, predictions, and models using evidence
- TLW think critically and logically to make the relationship between evidence and explanations
- TLW communicate scientific procedures and explanations
- TLW use mathematics in scientific inquiry

8.3 Physical Science

8.3.1 By the end of eighth grade, students will develop an understanding of properties and changes of properties in matter.

- TLW state the distinguishing characteristics of an element
- TLW describe the basic structure of an atom
- TLW define atomic number and mass number
- TLW compare solids, liquids, and gases
- TLW explain how compounds are formed
- TLW read and interpret chemical formulas

- 8.3.2 By the end of eighth grade, students will develop an understanding of motion and forces.
- 8.3.3 By the end of eighth grade, students will develop an understanding of the transfer of energy.
- TLW investigate and describe how heat is transferred from a warmer object to a cooler object until both reach the same temperature
 - TLW differentiate between conduction, convection, and radiation
 - TLW apply principles of conductivity and methods of heat transfer to real life situations
 - TLW compare the rate at which various substances found of Earth heat up and cool off

8.4 Life Science

- 8.4.1 By the end of eighth grade, students will develop an understanding of the structure and function in living systems.
- 8.4.2 By the end of eighth grade, students will develop an understanding of reproduction and heredity.
- 8.4.3 By the end of eighth grade, students will develop an understanding of regulation and behavior.
- 8.4.4 By the end of eighth grade, students will develop an understanding of populations and ecosystems.
- 8.4.5 By the end of eighth grade, students will develop an understanding of diversity and adaptations of organisms.

8.5 Earth and Space Science

- 8.5.1 By the end of eighth grade, students will develop an understanding of the structure of the earth.
- TLW investigate and describe the crust, mantle, and core of the earth
 - TLW differentiate between rocks and minerals
 - TLW list and define the physical and chemical characteristics used to identify minerals
 - TWL describe how the composition of magma and the time it takes to cool determine crystal formation
 - TWL describe the rock cycle and the changes rocks undergo
 - TLW differentiate between the three types of rocks and how they are formed
 - TLW identify agents of physical and chemical weathering

- TLW investigate and describe how various forces create landforms
- TLW investigate and describe the composition of soils
- TLW investigate and describe the water cycle
- TLW investigate and describe the composition of the atmosphere
- TLW describe the types of instruments used to make weather reports
- TLW compare and contrast high-pressure and low-pressure systems
- TLW investigate and describe components of weather (moisture, pressure, cloud formation, precipitation, fronts, storms, air masses, etc.)
- TLW describe the main features and characteristics of the oceans

8.5.2 By the end of eighth grade, students will develop an understanding of the earth's history.

- TLW investigate and describe how earth processes that occur today (e.g. volcanism, weather, erosion, plate movements, etc.) are similar to those that occurred in the past
- TLW investigate and explain how the fossil record can give clues to earth's past

8.5.3 By the end of eighth grade, students will develop an understanding of the earth in the solar system.

- TLW recognize and describe key components of the solar system
- TLW investigate and describe the motion of objects in the solar system that support the concepts of day, year, seasons, eclipses, and phases of the moon
- TLW investigate and describe the influence of gravity on objects in the solar system
- TLW differentiate between specific phases of the moon
- TLW describe the characteristics of other objects in space (asteroids, comets, meteors, meteorites, meteoroids)
- TLW differentiate between the three major types of galaxies (spiral, elliptical, irregular)
- TLW investigate characteristics of stars
- TLW describe the layers of the sun and the sun's features
- TLW explain how the sun converts matter into energy

8.6 Science and Technology

8.6.1 By the end of eighth grade, students will develop an understanding of technological design.

- TLW design a water rocket using a 2-liter soda bottle

8.6.2 By the end of eighth grade, students will develop an understanding of science and technology.

8.7 Science in Personal and Social Perspectives

- 8.7.1 By the end of eighth grade, students will develop an understanding of personal health
 - TLW identify and research substances harmful to human beings in the natural environment (e.g. radon, lead, nitrates, asbestos, etc.)
- 8.7.2 By the end of eighth grade, students will develop an understanding of populations, resources, and environments.
- 8.7.3 By the end of eighth grade, students will develop an understanding of natural hazards.
 - TWL investigate and describe human activities that affect weathering and erosion
- 8.7.4 By the end of eighth grade, students will develop an understanding of risks and benefits.
- 8.7.5 By the end of eighth grade, students will develop an understanding of science and technology in society.

8.8 History and Nature of Science

- 8.8.1 By the end of eighth grade, students will develop an understanding of science as a human endeavor.
- 8.8.2 By the end of eighth grade, students will develop an understanding of the nature of science.
 - TLW formulate and test a hypothesis using observations, experiments, and models
 - TLW evaluate the results of scientific investigations, experiments, observations, and the explanation proposed by other scientists
- 8.8.3 By the end of eighth grade, students will develop an understanding of the history of science.
 - TLW research and describe the difficulties experienced by scientific innovators who had to overcome commonly held beliefs of their times to reach conclusions that we now take for granted (Copernicus vs. Kepler)

Grades 9-12

12.1 Unifying Concepts and Processes

- 12.1.1 By the end of twelfth grade, students will develop an understanding of systems, order, and organization.

PRAIRIE/ECOLOGY

- Identify components of an ecosystem
- Identify, compare and contrast different grasses
- Use observation process to analyze the ecosystem
- Identify, explain, and use the information of the cycles of the prairie
- Explain human interaction as it effects the prairie
- Explain interdependence of bio diversity on the prairie
- Explain root systems and their involvement with natural resources
- Explain the relationship between ecosystems and the natural resources of water

WETLANDS

- Identify the interdependence of biodiversity of the wetland

CELLS

- Describe the universal components, structure and function of cells

CRANES

- Describe the relationship between the Platte River and ground water

INTERNAL SYSTEMS

- Identify and describe the interrelationship between the different cells, tissues and organs
- **Identify the systems of the body (digestive, nervous, circulatory, respiration, skeletal, muscular, endocrine)**

REPRODUCTION

- Describe the stages of mitosis and meiosis as they relate to reproduction

ANIMALS

- Identify and describe the classification and organization of animals

CLASSIFICATION OF KINGDOMS

- Identify, describe and classify the five kingdoms (Viruses, Monera, Protista, Fungi, Plantae, Animalia)
- Create a visual representation of the five kingdoms and describe differentiated characteristics
- Explain and use the taxonomy of organisms

CHEMISTRY AND MATTER

- Identify and classify states of matter: liquids, solids, gases according to their properties
- Describe and apply energy concepts in different systems

CHEMISTRY LITERACY

- Describe trends and relationships of the periodic table to periodic law

ANIMALS

- Identify and describe the classification and organization of animals

THE WORLD OF PHYSICAL SCIENCE

- Identify the steps used in the scientific method
- Explain how models represent real objects of systems

PROPERTIES OF MATTER

- Explain the importance of the International System of Units

ELEMENTS, COMPOUNDS, AND MIXTURES

- Classify elements according to their properties.

FORCES IN MOTION

- State and apply the law of conservation of momentum

THE PERIODIC TABLE

- Explain the periodic trends of the periodic table and the relationships between elements

Kinematics in two dimension

- Explain a problem using a free body diagram solve a projectile motion as one type of two dimensional motion with constant acceleration

Forces and Newton's Laws of Motion

- Apply and solve problems using Newton's first law of motion show that motion in two dimensions is similar to that already learned for one case.

12.1.2 By the end of twelfth grade, students will develop an understanding of evidence, models, and explanation.

CHEMISTRY AND MATTER

- Describe and use the scientific method
- Describe properties and calculate the energy involved in the changes of matter

ORGANIZATION OF MATTER

- Analyze Bohr's Model of the hydrogen atom
- Describe and use the Dalton's Theory

ELEMENTS, COMPOUNDS, AND MIXTURES

- Analyze a solution in terms of solute, solvent, and concentration.

MATTER IN MOTION

- Analyze and graph the relationship between velocity and acceleration.
- Explain the relationship between gravity and acceleration.

FORCES IN MOTION

- Compare the momentum of different objects.

CHEMICAL BONDING

- Explain the three different types of bonding.

Forces and Newton's Laws of Motion

- Apply and solve problems using Newton's first law of motion show that motion in two dimensions is similar to that already learned for one case.
- explain and solve problems using Newton's first and second laws of motion
- define surface (normal and gravitational) and explain that these are not fundamental forces

Dynamics of Uniform Circular Motion

- Apply Centripetal force to solve problems of banked curves, satellite orbits, and vertical circular motion.

Impulse and Momentum

- Use Newton's third law of motion to show that two colliding objects exert equal and opposite impulses on each other

12.1.3 By the end of twelfth grade, students will develop an understanding of change, constancy, and measurement.

CHEMISTRY AND MATTER

- Define and use the laws of conservation of matter and energy

ORGANIZATION OF MATTER

- Identify and use fundamental units of standard measurement
- Use the factor label method of converting units of measurement
- Describe and use derived units of measurement
- Use significant figures in measuring and calculating
- Use scientific notation in calculations
- Use Avogadro's principles of mole, number, and molar mass in calculating and solving problems

CHEMICAL EQUATIONS AND REACTIONS

- Formulate and solve chemical reactions
- Use stoichiometric calculations to solve chemical equations

THE WORLD OF PHYSICAL SCIENCE

- Explain the importance of the International System of Units.

PROPERTIES OF MATTER

- Explain the relationship between mass and inertia.

MATTER IN MOTION

- Analyze and graph the relationship between velocity and acceleration
- Explain the relationship between gravity and acceleration

WORK AND MACHINES

- Explain the difference between work and power

ENERGY AND ENERGY RESOURCES

- Explain the relationship between energy and work.

CHEMICAL COMPOUNDS

- Explain the difference between strong acids and bases and weak acids and bases.

THE ENERGY OF WAVES

- Explain how amplitude and frequency are related to the energy of a wave.

Kinematics in one dimension

- Explain and apply the first kinematic equation

Kinematics in two dimension

- Use the four vectors to solve the second kinematic equation

FORCES AND NEWTON'S LAWS OF MOTION

- explain and solve problems using Newton's first and second laws of motion
- explain and solve problems using Newton's third laws of motion

Dynamics of Uniform Circular Motion

- explain and solve problems about centripetal force using Newton's Laws

Work and Energy

- Explain and solve problems using the work-energy theorem

Impulse and Momentum

- Use Newton's third law of motion to show that two colliding objects exert equal and opposite impulses on each other

12.1.4 By the end of twelfth grade, students will develop an understanding of form and function.

WETLANDS

- Explain photosynthesis and cellular respiration
- Explain cell structure and function

Explain the function and components of a wetland

CHEMISTRY LITERACY

- Explain and use the VSEPR Theory

CELLs

Describe cell adaptations and differentiations

INTERNAL SYSTEMS

- Explain cells and tissue and their structures and functions
- Identify and describe the interrelationship between the different cells, tissues and organs

PLANTS

- Identify and explain the function and structure of leaves, stems, and roots

INTRODUCTION TO ATOMS

- Compare the charge, location, and relative mass of protons, neutrons, and electrons.

CHEMICAL BONDING

- Describe chemical bonding.
- Explain the three different types of bonding.

Refraction of Light at Curved Surfaces

- Know how the radius of a curvature of a cylinder is related to its focal point

Ray Diagrams for Lenses

- Determine whether an image is real, upright, virtual, inverted, enlarged, or diminished by looking @ a ray diagram

12.1.5 By the end of twelfth grade, students will develop an understanding of change over a period of time.

PRAIRIE/ECOLOGY

- Explain the relationship between ecosystems and water

WETLANDS

- Identify the interdependence of biodiversity of the wetland

BIOLOGY

- Succession

CELLS

- Analyze selection pressure (viral) as a factor of influencing natural selection

PHASES OF MATTER

- Use Boyle's, Charles', and Combined Gas Law in analyzing relationships between volume, pressure, and temperature
- Use stoichiometric calculations to solve chemical equations involving the gas laws
- Describe and use the Ideal Gas Law
- Analyze equilibrium and the influences and changes on matter

SOLUTIONS AND THEIR BEHAVIORS

- Analyze equilibrium and the influences and changes on solutions
- Describe equilibrium between ion concentrations of acids and bases
- Analyze acid and base reactions

GENETICS

- Analyze the probability of dominant and recessive traits being expressed in a population (Punnett Square)

GENETIC CHANGE

- Analyze the HardyWeinberg equation for determining shifts in genetic structures
- Describe Natural Selection as a major mechanism for causing genetic shift
- Analyze the probabilities of gene frequencies in populations
- Analyze selection pressure (viral) as a factor of influencing natural selection
- Describe agents of change in a population

12.2 Science as Inquiry

12.2.1 By the end of twelfth grade, students will develop the abilities needed to do scientific inquiry.

PRAIRIE/ECOLOGY

- Analyze different soil types
- Use Scientific Method to process information on the prairie

WETLANDS

- Test ecological systems of a wetland and examine them for relationships
- Write technical/objective, lab reports

CHEMISTRY AND MATTER

- Identify and use the scientific method

CELLS

- Describe the transportation of materials in and out of the cell (osmosis, bulk flow, diffusion, endocytosis, passive and active transport)

PLANTS

- Analyze different soil types

GENETIC CHANGE

- Analyze the HardyWeinberg equation for determining shifts in genetic structures
- Describe Natural Selection as a major mechanism for causing genetic shift

Analyze the probabilities of gene frequencies in populations

THE WORLD OF PHYSICAL SCIENCE

- Identify the steps used in the scientific method

PROPERTIES OF MATTER

- Compare physical and chemical properties

MATTER IN MOTION

- Explain why friction occurs.
- Explain how friction can be both harmful and helpful.

WORK AND MACHINES

- Calculate the amount of work done on an object.
- Identify the simple machines that make up a compound machine.
- Explain how a machine makes work easier.

ENERGY AND ENERGY RESOURCES

- Evaluate the advantages and disadvantages of using various energy resources

KINEMATICS IN ONE DIMENSION

- Explain the differences between distance and displacement
- Explain and apply the first kinematic equation

Kinematics in two dimension

- Use the four vectors to solve the second kinematic equation
- Explain a problem using a free body diagram solve a projectile motion as one type of two dimensional motion with constant acceleration

Forces and Newton's Laws of Motion

- Apply and solve problems using Newton's first law of motion show that motion in two dimensions is similar to that already learned for one case.
- calculate the projectile motion as one type of two dimensional motion with a constant acceleration
- explain and solve problems using Newton's first and second laws of motion
- explain and solve problems using Newton's third laws of motion
- calculate problems of gravitation using Newton's law

Dynamics of Uniform Circular Motion

- explain and solve problems about centripetal force using Newton's Laws
- Apply Centripetal force to solve problems of banked curves, satellite orbits, and vertical circular motion.

Work and Energy

- Explain and solve problems using the work-energy theorem

Impulse and Momentum

- Use Newton's third law of motion to show that two colliding objects exert equal and opposite impulses on each other
- //show velocity of center of mass- before and after collision- linear momentum of the systems remain constant

Rotational Kinematics

- Solve problems of constant angular acceleration using equations of rotational kinematics
- Demonstrate the relationship between tangential and angular variable for a body rotating about a fixed axis

Rotational Dynamics

- Explain and solve problems using Newton's Second Law for rotational motion and rotational inertia

Waves and Sound

- Define a wave, wavelength, and sound.

Plane mirrors

- Construct the reflected ray for a given incident ray and mirror
- Diagram and explain the angle of reflection is related to the angle of incidence
be able to apply the law of reflection to various problems

Reflection of Light at Flat Surfaces

- Given the indices of refraction or the relative densities, calculate and diagram the direction light bends when going from one medium to another

Refraction of Light at Curved Surfaces

- Know how the radius of a curvature of a cylinder is related to its focal point

Ray Diagrams for Lenses

- Determine whether an image is real, upright, virtual, inverted, enlarged, or diminished by looking @ a ray diagram

Ray Diagrams for Lenses

- Determine whether an image is real, upright, virtual, inverted, enlarged, or diminished by looking @ a ray diagram

12.3 Physical Science

12.3.1 By the end of twelfth grade, students will develop an understanding of the structure of the atom.

ORGANIZATION OF MATTER

- Analyze Bohr's Model of the hydrogen atom
- Describe and use the Dalton Theory
- Identify and describe the subatomic particles of an atom
- Describe the Quantum Theory and how it relates to chemistry
- **Describe and use quantum numbers (i.e., electron configuration, aufbau principle, Hund's rule, Pauli exclusion principle)**
- Calculate orbital notation, electron configuration, and electron dot

CHEMISTRY LITERACY

- Calculate protons, neutrons, and electrons of a given element
- Analyze bond length and bond energy in forming chemical bonds
- Describe and use the octet rule
- Explain multiple bonds
- Explain and use polyatomic bonds
- Explain and use the VSEPR Theory

INTRODUCTION TO ATOMS

- Explain how the atomic theory has changed as scientists have discovered new theories about the atom.
- Compare the charge, location, and relative mass of protons, neutrons, and electrons.
- Calculate the number of particles in an atom using the atomic number, mass number, and overall charge.
- Calculate the atomic mass of elements

12.3.2 By the end of twelfth grade, students will develop an understanding of the structure and properties of matter.

CHEMISTRY AND MATTER

- Define the laws of conservation of matter and energy

SOLUTIONS AND THEIR BEHAVIORS

- Describe physical properties of water
- Describe factors in dissolving rates
- Describe properties of electrolytes
- Describe properties of acids and bases

CHEMISTRY LITERACY

- **Identify and describe different types of chemical bonding (i.e., ionic, covalent, and polar covalent)**

CHEMICAL EQUATIONS AND REACTIONS

- Identify different types of reactions

PHASES OF MATTER

- Describe the energy involved in phase changes of matter
- Describe properties of solid, liquids, and gases
- Analyze qualitative and quantitative descriptions of gases

PROPERTIES OF MATTER

- Compare physical and chemical properties
- Explain what happens to matter during physical and chemical changes

STATES OF MATTER

- Describe the properties shared by all particles of matter.
- Describe and explain the four states of matter.
- Compare the changes of states of matter.

ELEMENTS, COMPOUNDS, AND MIXTURES

- Classify elements according to their properties.
- Describe the characteristics of elements

CHEMICAL BONDING

- Describe chemical bonding.

12.3.3 By the end of twelfth grade, students will develop an understanding of chemical reactions.

CHEMICAL EQUATIONS AND REACTIONS

- Identify different types of reactions
- Balance chemical compounds and equations
- Formulate and solve chemical reactions

PHASES OF MATTER

- Use stoichiometric calculations to solve chemical equations involving the gas laws

CHEMICAL REACTIONS

- Identify the clues that indicate a chemical reaction might be taking place.
- Interpret and write simple chemical formulas.
- Interpret and write simple balanced chemical equations.
- Explain how a balanced equation illustrates the law of conservation of mass.
- Describe four types of chemical reactions.
- Classify a chemical equation as one of the four types of chemical reactions.

12.3.4 By the end of twelfth grade, students will develop an understanding of motions

and forces.

MATTER IN MOTION

- Determine the difference between speed and velocity.
- Analyze and graph the relationship between velocity and acceleration.
- Determine the net force on an object.
- Define gravity.
- Solve problems using the universal law of gravity.
- Explain the relationship between gravity and acceleration.

FORCES IN MOTION

- State and apply Newton's laws of motion.
- Compare the momentum of different objects.
- State and apply the law of conservation of momentum

WORK AND MACHINES

- Calculate the amount of work done on an object.
- Identify the simple machines that make up a compound machine.
- Explain how a machine makes work easier.
- Explain the difference between work and power

ENERGY AND ENERGY RESOURCES

- Explain the relationship between energy and work.
- Compare kinetic and potential energy.
- Explain the law of conservation of energy.
- Evaluate the advantages and disadvantages of using various energy resources

Kinematics in one dimension

- Explain the differences between distance and displacement
- Calculate speed and velocity
- Explain and apply the first kinematic equation

Kinematics in two dimension

- Use the four vectors to solve the second kinematic equation
- Explain a problem using a free body diagram solve a projectile motion as one type of two dimensional motion with constant acceleration

Forces and Newton's Laws of Motion

- Apply and solve problems using Newton's first law of motion show that motion in two dimensions is similar to that already learned for one case.
- diagram a free body diagram
- ??? provide several examples of correct usage of the kinematic equations
- calculate the projectile motion as one type of two dimensional motion with a constant acceleration

Forces and Newton's Laws of Motion

- explain and solve problems using Newton's first and second laws of motion
- construct a free body diagrams and emphasize their importance in problem solving
- explain and solve problems using Newton's third laws of motion
- calculate problems of gravitation using Newton's law
- define surface (normal and gravitational) and explain that these are not fundamental forces

Dynamics of Uniform Circular Motion

- define uniform circular motion
- explain and solve problems about centripetal force using Newton's Laws
- Apply Centripetal force to solve problems of banked curves, satellite orbits, and vertical circular motion.

Work and Energy

- Define work
- Explain and solve problems using the work-energy theorem
- ???conservative of nonconservative forces
- ???? watt = ave. rate

Impulse and Momentum

- Use Newton's third law of motion to show that two colliding objects exert equal and opposite impulses on each other
- define impulse
- define linear momentum
- ???center of mass pg 103
- ///show velocity of center of mass- before and after collision- linear momentum of the systems remain constant

Rotational Kinematics

- Define angular displacement
- Define the instantaneous and average rotational velocities
- Solve problems of constant angular acceleration using equations of rotational kinematics
- Demonstrate the relationship between tangential and angular variable for a body rotating about a fixed axis

Rotational Dynamics

- Define torque
- Explain and solve problems using Newton's Second Law for rotational motion and rotational inertia
- Explain rotational work and kinetic energy

Waves and Sound

- Define a wave, wavelength, and sound.

- Utilize equations to solve for problems dealing with sound and other mediums that influence sound

Plane mirrors

- Construct the reflected ray for a given incident ray and mirror
- Diagram and explain the angle of reflection is related to the angle of incidence
be able to apply the law of reflection to various problems

Reflection of Light at Flat Surfaces

- Given the indices of refraction or the relative densities, calculate and diagram the direction light bends when going from one medium to another

Refraction of Light at Curved Surfaces

- Construct the path of a light ray as it travels through an object that

12.3.5 By the end of twelfth grade, students will develop an understanding of the conservation of energy and increase in disorder.

CHEMISTRY AND MATTER

- Describe properties and changes of matter
- Describe the effects and influences of energy on changes of matter
- Define the laws of conservation of matter and energy

ORGANIZATION OF MATTER

- Define heat and temperature

ENERGY AND ENERGY RESOURCES

- Explain the relationship between energy and work.
- Compare kinetic and potential energy.
- Explain the law of conservation of energy.
- Evaluate the advantages and disadvantages of using various energy resources

Kinematics in two dimension

- Use the four vectors to solve the second kinematic equation
- Explain a problem using a free body diagram solve a projectile motion as one type of two dimensional motion with constant acceleration

Forces and Newton's Laws of Motion

- Apply and solve problems using Newton's first law of motion show that motion in two dimensions is similar to that already learned for one case.
- diagram a free body diagram
- ??? provide several examples of correct usage of the kinematic equations

- calculate the projectile motion as one type of two dimensional motion with a constant acceleration

Forces and Newton's Laws of Motion

- explain and solve problems using Newton's first and second laws of motion
- construct a free body diagrams and emphasize their importance in problem solving
- explain and solve problems using Newton's third laws of motion
- calculate problems of gravitation using Newton's law
- define surface (normal and gravitational) and explain that these are not fundamental forces

Dynamics of Uniform Circular Motion

- define uniform circular motion
- explain and solve problems about centripetal force using Newton's Laws
- Apply Centripetal force to solve problems of banked curves, satellite orbits, and vertical circular motion.

Work and Energy

- Define work
- Explain and solve problems using the work-energy theorem
- ???conservative of nonconservative forces
- ??? watt = ave. rate

Impulse and Momentum

- Use Newton's third law of motion to show that two colliding objects exert equal and opposite impulses on each other
- define impulse
- define linear momentum
- ???center of mass pg 103
- ///show velocity of center of mass- before and after collision- linear momentum of the systems remain constant

Rotational Kinematics

- Define angular displacement
- Define the instantaneous and average rotational velocities
- Solve problems of constant angular acceleration using equations of rotational kinematics
- Demonstrate the relationship between tangential and angular variable for a body rotating about a fixed axis

Rotational Dynamics

- Define torque

- Explain and solve problems using Newton's Second Law for rotational motion and rotational inertia
- Explain rotational work and kinetic energy

12.3.6 By the end of twelfth grade, students will develop an understanding of the interactions of energy and matter.

CHEMISTRY AND MATTER

- Describe and apply energy concepts in different systems
- Describe properties and changes of matter

CHEMISTRY LITERACY

- Analyze bond length and bond energy in forming chemical bonds

PHASES OF MATTER

- Analyze physical characteristics of gases
- Use Boyle's, Charles', and Combined Gas Law in analyzing relationships between volume, pressure, and temperature
- Analyze equilibrium and the influences and changes of matter

SOLUTIONS AND THEIR BEHAVIORS

- Analyze equilibrium and the influences and changes on solutions

PROPERTIES OF MATTER

Explain what happens to matter during physical and chemical changes

STATES OF MATTER

Describe and explain the four states of matter.

Compare the changes of states of matter.

THE ENERGY OF WAVES

- Describe how waves transfer energy without transferring matter.
- Distinguish between waves that require a medium and waves that do not.
- Explain the difference between transverse and longitudinal waves.
- Explain how amplitude and frequency are related to the energy of a wave.

12.4 Life Science

12.4.1 By the end of twelfth grade, students will develop an understanding of the cell.

WETLANDS

- Explain cell structure and function

CELLS

- Describe the universal components, structure and function of cells
- Describe the organization and classification (prokaryotes and eukaryotes)
- Describe energy transformations of cells (Photosynthesis, respiration, glycolysis, Krebs Cycle, electron transport chain, C04)
- Describe the control mechanism of the cell (nucleus, DNA, protein synthesis)
- Describe cell reproduction (mitosis)
- Analyze the differences between normal cells and cancerous cells
- Describe the transportation of materials in and out of the cell (osmosis, bulk flow, diffusion, endocytosis, passive and active transport)

GENETICS

- Describe DNA replication and recombination
- Describe the transformation of DNA information to RNA information (translation)

12.4.2 By the end of twelfth grade, students will develop an understanding of the molecular basis of heredity.

REPRODUCTION

Describe the stages of mitosis and meiosis

- Describe DNA replication
- Describe sexual and asexual reproduction

GENETICS

- Describe Mendelian Genetics (triad)
- Describe DNA replication and recombination
- Analyze the roles of adaptations and mutations
- Describe genotypes and phenotypes
- Analyze the probability of dominate and recessive traits being expressed in a population (Punnett Square)

GENETIC CHANGE

- Analyze theories of genetic change
- Explain the role of variability in a gene pool
- Analyze the probabilities of gene frequencies in populations
- Describe Natural Selection as a major mechanism for causing genetic shift

12.4.3 By the end of twelfth grade, students will develop an understanding of the theory of biological evolution.

GENETIC CHANGE

- Analyze theories of genetic change
- Explain the role of variability in a gene pool
- Describe agents of change in a population
- Analyze the HardyWeinberg equation for determining shifts in genetic structures
- Describe Natural Selection as a major mechanism for causing genetic shift
- Analyze the probabilities of gene frequencies in populations
- Analyze selection pressure (viral) as a factor of influencing natural selection

12.4.4 By the end of twelfth grade, students will develop an understanding of the interdependence of organisms.

PRAIRIE/ECOLOGY

- Identify and explain producers and consumers
- Identify and explain biotic and abiotic components and their interactions
- Explain human interaction
- Explain interdependence of bio diversity
- Identify different ecosystems of Nebraska
- Explain the relationship between ecosystems and water

WETLANDS

- Identify the interdependence of biodiversity of the wetland
- Identify abiotic an biotic factors of a wetland
- Identify the carbon and oxygen cycles of a wetland

CRANE

- Explain the ecology and history of the Platte River
- Explain the habitat of the Sandhill Crane

ANIMALS

- Analyze interactions between animals and their roles within ecosystems (niche)

12.4.5 By the end of twelfth grade, students will develop an understanding of matter, energy, and organization in living systems.

PRAIRIE/ECOLOGY

- Identify and explain producers and consumers
- Identify and explain biotic and abiotic components and their interactions
- Identify energy and matter transformations (lab)
- Explain root systems and their involvement with natural resources

WETLANDS

- Identify abiotic and biotic factors of a wetland
- Explain the place of a wetland in our environment

CELLS

- Describe energy transformations of cells (Photosynthesis, respiration, glycolysis, Krebs Cycle, electron transport chain, CO₂)

CRANE

- Explain the ecology and history of the Platte River

12.4.6 By the end of twelfth grade, students will develop an understanding of the behavior of organisms.

PRAIRIE/ECOLOGY

- Use Scientific Method to process information on the prairie

CRANE

- Explain the ecology and history of the Platte River

PLANTS

- Describe plant transpiration systems (translocation and transpiration)
- Identify plants response to stimulus

ANIMALS

- Analyze behaviors of animals to stimulus and environmental factors

12.5 Earth and Space Science

12.5.1 By the end of twelfth grade, students will develop an understanding of energy in the earth system.

12.5.2 By the end of twelfth grade, students will develop an understanding of geochemical cycles.

12.5.3 By the end of twelfth grade, students will develop a scientific understanding of the origin of earth system.

12.5.4 By the end of twelfth grade, students will develop a scientific understanding of the origin of the universe.

12.6 Science and Technology

12.6.1 By the end of twelfth grade, students will develop an understanding of technological design.

PRAIRIE/ECOLOGY

- Explain human interaction
- Use Scientific Method to process information on the prairie

THE ENERGY OF WAVES

- 1 Explain how amplitude and frequency are related to the energy of a wave.

INTRODUCTION TO ELECTRICITY

- 1 Describe three ways an object can become charged.
- 2 Compare conductors with insulators.
- 3 Explain how a cell produces an electric current.
- 4 Explain how current, voltage, and resistance are related by Ohm's Law.
- 5 Describe how electric power is related to electrical energy.
- 6 Compare series circuits with parallel circuits.

Rotational Kinematics

- 1 Demonstrate the relationship between tangential and angular variable for a body rotating about a fixed axis

Rotational Dynamics

- 1 Explain rotational work and kinetic energy

Waves and Sound

- 2 Utilize equations to solve for problems dealing with sound and other mediums that influence sound

Refraction of Light at Curved Surfaces

- 1 Know how the radius of a curvature of a cylinder is related to its focal point

Ray Diagrams for Lenses

- 2 Determine whether an image is real, upright, virtual, inverted, enlarged, or diminished by looking @ a ray diagram

12.6.2 By the end of twelfth grade, students will develop an understanding about science and technology.

INTRODUCTION TO ELECTRICITY

- 3 Describe three ways an object can become charged.
- 4 Compare conductors with insulators.
- 5 Explain how a cell produces an electric current.

- 6 Explain how current, voltage, and resistance are related by Ohm's Law.
- 7 Describe how electric power is related to electrical energy.
- 8 Compare series circuits with parallel circuits.

Plane mirrors

- 9 Diagram and explain the angle of reflection is related to the angle of incidence be able to apply the law of reflection to various problems

Refraction of Light at Curved Surfaces

- 10 Know how the radius of a curvature of a cylinder is related to its focal point

Ray Diagrams for Lenses

- 11 Determine whether an image is real, upright, virtual, inverted, enlarged, or diminished by looking @ a ray diagram

12.7 Science in Personal and Social Perspectives

12.7.1 By the end of twelfth grade, students will develop an understanding of personal and community health.

GENETICS

- 1 Analyze the roles of adaptations and mutations

GENETIC CHANGE

- 2 Explain the role of variability in a gene pool
- 3 Analyze the probabilities of gene frequencies in populations

12.7.2 By the end of twelfth grade, students will develop an understanding of the effects of population change.

CRANE

- 1 Explain the ecology and history of the Platte River

GENETICS

- 2 Analyze the probability of dominant and recessive traits being expressed in a population (Punnett Square)
- 3 Describe agents of change in a population
- 4 Analyze the HardyWeinberg equation for determining shifts in genetic structures
- 5 Describe Natural Selection as a major mechanism for causing genetic shift
- 6 Analyze the probabilities of gene frequencies in populations

GENETIC CHANGE

- 1 Explain the role of variability in a gene pool

12.7.3 By the end of twelfth grade, students will develop an understanding of natural resources.

PRAIRIE/ECOLOGY

- 2 Explain human interaction
- 3 Explain the relationship between ecosystems and water

WETLANDS

- 1 Explain the place of a wetland in our environment
- 2 Identify the values of preservation of a wetland

CRANE

- 1 Explain the ecology and history of the Platte River
Describe the relationship between the Platte River and ground water

12.7.4 By the end of twelfth grade, students will develop an understanding of environmental quality.

PRAIRIE/ECOLOGY

- 1 Explain human interaction
- 2 Explain the relationship between ecosystems and water

WETLANDS

- 1 Explain the place of a wetland in our environment
- 2 Identify the values of preservation of a wetland

CRANES

Describe the relationship between the Platte River and ground water

- 1 Explain the roles of the cranes to other cultures

12.7.5 By the end of twelfth grade, students will develop an understanding of natural and human-induced hazards.

PRAIRIE/ECOLOGY

- 1 Explain human interaction
- 2 Explain the relationship between ecosystems and water

WETLANDS

- 1 Explain the place of a wetland in our environment
- 2 Identify the values of preservation of a wetland

CRANES

Describe the relationship between the Platte River and ground water

12.7.6 By the end of twelfth grade, students will develop an understanding of the role of science and technology in local, national, and global challenges.

WETLANDS

- 1 Explain the place of a wetland in our environment
- 2 Identify the values of preservation of a wetland
- 3 Identify the regulatory and nonregulatory agencies involved

CRANES

- 1 Describe the relationship between the Platte River and ground water

12.8 History and Nature of Science

12.8.1 By the end of twelfth grade, students will develop an understanding of science as a human endeavor.

INTRODUCTION TO ATOMS

- 1 Explain how the atomic theory has changed as scientists have discovered new theories about the atom.

12.8.2 By the end of twelfth grade, students will develop an understanding of the nature of scientific knowledge.

INTRODUCTION TO ATOMS

- 2 Explain how the atomic theory has changed as scientists have discovered new theories about the atom.

12.8.3 By the end of twelfth grade, students will develop an understanding of the history of science.

INTRODUCTION TO ATOMS

- 3 Explain how the atomic theory has changed as scientists have discovered new theories about the atom.