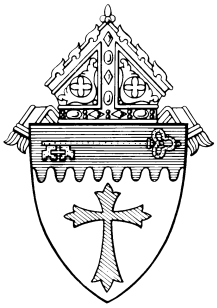
Elementary and Middle School Science Curriculum Guidelines



Catholic Schools Office
Diocese of Erie
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This Science Curriculum is the result of extensive work on the part of the committee members, who drew upon a variety of resources to provide a curriculum document which is aligned with both national and state standards.

Sincere thanks to:

Fay Hadaway-Nelson, Chairperson	Our Lady's Christian School
Stephanie Ackman	Blessed Sacrament School
Joni Blackman	Villa Maria Elementary School
Nancy Donnelly	Our Lady's Christian School
Maria Ehrman	Our Lady of Peace School
Donna Franz	Our Lady of Mount Carmel School
Mary Wright	Villa Maria Elementary School

Teachers using these curriculum guidelines will want to be aware that:

1. the science curriculum overlaps with other curricular areas, including religion, health, and technology, providing an excellent opportunity for curriculum integration. With careful planning, projects and assignments given in science may well satisfy objectives in other areas.
2. objectives from one grade level are often repeated in later grade levels. The first draft of the document was based on the NSES model (K-4 and 5-8). Later drafts, including this one, were designed to be more user-friendly for teachers on a particular grade level by extracting objectives and assigning them to grade levels. It is hoped that teachers will collaborate among grades, allowing effective "uncoverage" of the material without needless repetition.

Educators seeking further information about the standards should refer to The National Science Education Standards, available in hard copy from the National Academy Press and also available online. This publication discusses the standards at length and offers a variety of teaching strategies for each. An excerpt is provided in the appendix.

For easy reference when planning lessons, each objective has been assigned a code (in bold) which can be notated in lesson plans. For example, in the code SK2.5, "S" refers to Science, "K" to kindergarten, "2" to the second standard (physical science), and "5" to the fifth objective.

Darlene Elsesser Kovacs
Director of Elementary School Curriculum and Teacher Personnel

Kindergarten

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **SK1.1** Observe objects or events in a variety of ways using one or more of the senses
- **SK1.2** Identify properties of an object, e.g., shape, color, size, texture
- **SK1.3** Begin to use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **SK1.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **SK1.5** Identify properties useful for classifying objects
- **SK1.6** Begin to group objects by their properties or similarities/differences
- **SK1.7** Construct and use classification systems

INFERRING

- **SK1.8** Suggest explanations for events based on observations

PREDICTING

- **SK1.9** Begin to forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **SK1.10** Compare and order objects by length, area, weight, volume, etc.
- **SK1.11** Begin to measure properties of objects or events, e.g., temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **SK1.12** Construct and use drawings or graphs to transmit information learned from science experiences
- **SK1.13** Verbally ask questions about, discuss, explain, or report observations

USING SPACE/TIME RELATIONS

- **SK1.14** Describe an object's position in relation to other objects, e.g., above, below, beside
- **SK1.15** Describe the motion, direction, and shape of an object compared to another object

DEFINING OPERATIONALLY

FORMULATING HYPOTHESES

- **SK1.16** Suggest questions or statements which can be tested
- **SK1.17** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **SK1.18** Suggest a question for investigation
- **SK1.19** Conduct simple experiments
- **SK1.20** Use simple equipment to gather data and extend the senses
- **SK1.21** Utilize safe procedures while conducting investigations

RECOGNIZING VARIABLES

INTERPRETING DATA

- **SK1.22** Construct a new explanation based on new information or revised data
- **SK1.23** Use mathematics to interpret data
- **SK1.24** Give examples of mathematics used in scientific inquiry, based on Math Curriculum Guidelines

FORMULATING MODELS

- **SK1.25** Create a mental, physical, or verbal representation of an idea, object, or event
- **SK1.26** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **SK2.1** Demonstrate that all matter takes up space and has weight

- **SK2.2** Differentiate among solids, liquids, and gases, giving examples of each
- **SK2.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating

MATTER: WATER
- **SK2.4** Describe water as a unique substance essential to living functions
- **SK2.5** Predict ability of objects to float in water

MATTER: ELEMENTS
- **SK2.6** Separate the components of a mixture

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS
- **SK2.7** Define energy as the ability to do work
- **SK2.8** Describe and practice methods of conserving energy

ENERGY: ELECTRICITY
- **SK2.9** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber
- **SK2.10** Explain a variety of ways in which electricity is used
- **SK2.11** Construct electrical circuits using batteries, bulbs, wires

ENERGY: MAGNETISM
- **SK2.12** Sort objects according to magnetic and non-magnetic properties
- **SK2.13** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR
- **SK2.14** Demonstrate the use of a lens, mirror, and prism with the path of light
- **SK2.15** Begin to use terms: straight line of travel, reflection of an image
- **SK2.16** Generate and identify different colors of pigment

ENERGY: SOUND
- **SK2.17** Describe variations in sound, e.g., low/high, soft/loud
- **SK2.18** Produce sound using vibration of objects
- **SK2.19** Recognize variations in pitch and frequency
- **SK2.20** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT
- **SK2.21** Demonstrate heat as a change agent, e.g., cooking, melting
- **SK2.22** Suggest ways in which heat is produced

- **SK2.23** Measure temperature in appropriate units
- **SK2.24** Begin to recognize the heat transfer mechanisms: conduction, convection, radiation

ENERGY: FORCE AND MACHINES

- **SK2.25** Identify pushing or pulling on a object as a force
- **SK2.26** Give examples of forces that move objects
- **SK2.27** Begin to recognize gravity as a force
- **SK2.28** Begin to recognize a simple machine
- **SK2.29** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **SK3.1** Recognize the difference between living and non-living things
- **SK3.2** Identify basic needs of living things
- **SK3.3** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **SK3.4** Identify similarities/differences in physical characteristics of living things

MICROORGANISMS

PLANTS

- **SK3.5** Identify the basic characteristics of plants
- **SK3.6** Illustrate ways in which seeds can be dispersed
- **SK3.7** Recognize the process of photosynthesis, e.g., “a plant can make its own food”
- **SK3.8** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **SK3.9** Identify ways in which people use plants
- **SK3.10** Understand that different parts of a plant have different functions

ANIMALS

- **SK3.11** Compare similarities/differences among various groups of animals
- **SK3.12** Give examples of ways in which animals have adapted to their environment

- **SK3.13** Observe and describe animal behavior
- **SK3.14** Identify a variety of animals that are meat eaters/plant eaters

ECOLOGY

- **SK3.15** Define environment
- **SK3.16** Explain characteristics of his/her environment
- **SK3.17** Give examples of changes in environments
- **SK3.18** List some effects of changes in environments
- **SK3.19** Identify local plant and animal species
- **SK3.20** Construct food chains/food webs
- **SK3.21** Begin to describe ways in which populations of plants and animals in a community interact with one another and their environment
- **SK3.22** Explain the impact of one's personal life on the environment
- **SK3.23** Identify and practice methods for lessening that impact
- **SK3.24** Identify organisms that require different environments
- **SK3.25** Construct and maintain an aquarium/terrarium habitat
- **SK3.26** Give examples of the adaptation of a species to its environment
- **SK3.27** Explain how adaptation may contribute to survival, giving examples

HEREDITY AND EVOLUTION

- **SK3.28** Match offspring with their parents
- **SK3.29** Discuss similarities/differences between individuals within their own families

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **SK4.1** Identify major geological features of the earth's surface

EARTH CHANGES

- **SK4.2** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **SK4.3** Distinguish between forces that cause rapid change/slow change of the earth's surface

ANCIENT LIFE

- **SK4.4** Compare ancient life with life today
- **SK4.5** Begin to identify fossils as remains of prehistoric plants or animals

- **SK4.6** Describe ways in which fossils can be used to acquire information
- **SK4.7** Make a simulated fossil

NATURAL RESOURCES

- **SK4.8** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **SK4.9** Describe ways in which people waste natural resources and opportunities for conservation

WEATHER

- **SK4.10** Begin to identify the concept of the water cycle
- **SK4.11** Observe, describe, and record daily weather conditions over a period of time
- **SK4.12** Discuss seasonal weather changes
- **SK4.13** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **SK4.14** Describe climatic zones of the earth: polar, temperate, tropic

SOLAR SYSTEM

- **SK4.15** Identify the sun as the source of the earth's energy (light and heat)
- **SK4.16** Describe a variety of objects in the sky, e.g., sun, moon
- **SK4.17** Using models, describe the movements of the earth, sun, and moon
- **SK4.18** Compare/contrast characteristics of the planets in our solar system
- **SK4.19** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **SK5.1** Identify a simple problem
- **SK5.2** Suggest tools that might be used to solve the problem
- **SK5.3** Propose a solution
- **SK5.4** Implement the proposed solution
- **SK5.5** Communicate the results of this process
- **SK5.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **SK5.7** Communicate his/her findings about the product

ROLE OF SCIENCE AND TECHNOLOGY

- **SK5.8** Describe examples of the use of science to explain the natural world
- **SK5.9** Recognize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **SK5.10** Distinguish between natural/manufactured objects
- **SK5.11** Give examples of natural/manufactured objects

Content Standard F: Science in Personal and Social Perspectives

Please note that Content Standard F is covered in Standard C/Ecology.

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **SK7.1** Recognize science as a career
- **SK7.2** Give examples of scientists working in teams

Grade One

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S11.1** Observe objects or events in a variety of ways using one or more of the senses
- **S11.2** Identify properties of an object, e.g., shape, color, size, texture
- **S11.3** Begin to use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **S11.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **S11.5** Identify properties useful for classifying objects
- **S11.6** Begin to group objects by their properties or similarities/differences
- **S11.7** Construct and use classification systems

INFERRING

- **S11.8** Suggest explanations for events based on observations

PREDICTING

- **S11.9** Begin to forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **S11.10** Compare and order objects by length, area, weight, volume, etc.
- **S11.11** Begin to measure properties of objects or events, e.g., weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **S11.12** Construct and use drawings, diagrams, or graphs to transmit information learned from science experiences
- **S11.13** Verbally ask questions about, discuss, explain, or report observations

USING SPACE/TIME RELATIONS

- **S11.14** Describe an object's position in relation to other objects, e.g., above, below, beside
- **S11.15** Describe the motion, direction, and shape of an object compared to another object

DEFINING OPERATIONALLY

- **S11.16** Begin to state definitions of objects or events in terms of what the object is doing or what is occurring in the event.

FORMULATING HYPOTHESES

- **S11.17** Suggest questions or statements which can be tested
- **S11.18** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **S11.19** Suggest a question for investigation
- **S11.20** Conduct simple experiments
- **S11.21** Use simple equipment to gather data and extend the senses
- **S11.22** Utilize safe procedures while conducting investigations

RECOGNIZING VARIABLES

INTERPRETING DATA

- **S11.23** Construct a new explanation based on new information or revised data
- **S11.24** Use mathematics to interpret data
- **S11.25** Give examples of mathematics used in scientific inquiry, based on Math Curriculum Guidelines
- **S11.26** Understand that new information can lead to new discoveries.

FORMULATING MODELS

- **S11.27** Create a mental, physical, or verbal representation of an idea, object, or event
- **S11.28** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S12.1** Demonstrate that all matter takes up space and has weight
- **S12.2** Differentiate among solids, liquids, and gases, giving examples of each
- **S12.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating

MATTER: WATER

- **S12.4** Describe water as a unique substance essential to living functions
- **S12.5** Predict ability of objects to float in water

MATTER: ELEMENTS

- **S12.6** Separate the components of a mixture

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S12.7** Define energy as the ability to do work
- **S12.8** Understand energy as a property of many substances
- **S12.9** Describe and practice methods of conserving energy

ENERGY: ELECTRICITY

- **S12.10** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber
- **S12.11** Explain a variety of ways in which electricity is used
- **S12.12** Construct electrical circuits using batteries, bulbs, wires

ENERGY: MAGNETISM

- **S12.13** Sort objects according to magnetic and non-magnetic properties
- **S12.14** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR

- **S12.15** Demonstrate the use of a lens, mirror, and prism with the path of light
- **S12.16** Begin to use terms: straight line of travel, reflection of an image
- **S12.17** Generate and identify different colors of pigment

ENERGY: SOUND

- **S12.18** Describe variations in sound, e.g., low/high, soft/loud
- **S12.19** Produce sound using vibration of objects
- **S12.20** Recognize variations in pitch and frequency
- **S12.21** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT

- **S12.22** Demonstrate heat as a change agent, e.g., cooking, melting
- **S12.23** Suggest ways in which heat is produced
- **S12.24** Measure temperature in appropriate units
- **S12.25** Begin to recognize the heat transfer mechanisms: conduction, convection, radiation

ENERGY: FORCE AND MACHINES

- **S12.26** Identify pushing or pulling on a object as a force
- **S12.27** Give examples of forces that move objects
- **S12.28** Begin to recognize gravity as a force
- **S12.29** Begin to recognize a simple machine
- **S12.30** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S13.1** Recognize the differences between living and non-living things
- **S13.2** Classify familiar objects as living or non-living
- **S13.3** Identify basic needs of living things
- **S13.4** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **S13.5** Identify similarities/differences in physical characteristics of living things

MICROORGANISMS

PLANTS

- **S13.6** Identify the basic characteristics of plants
- **S13.7** Illustrate ways in which seeds can be dispersed
- **S13.8** Recognize the process of photosynthesis, e.g., “a plant can make its own food”
- **S13.9** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **S13.10** Identify ways in which people use plants
- **S13.11** Understand that the different parts of a plant have different functions

ANIMALS

- **S13.12** Compare similarities/differences among various groups of animals
- **S13.13** Give examples of ways in which animals have adapted to their environment
- **S13.14** Observe and describe animal behavior
- **S13.15** Identify a variety of animals that are meat eaters/plant eaters

ECOLOGY

- **S13.16** Define environment
- **S13.17** Explain characteristics of his/her environment
- **S13.18** Give examples of changes in environments
- **S13.19** List some effects of changes in environments
- **S13.20** Identify local plant and animal species
- **S13.21** Construct food chains/food webs
- **S13.22** Begin to describe ways in which populations of plants and animals in a community interact with one another and their environment
- **S13.23** Explain the impact of one’s personal life on the environment
- **S13.24** Identify and practice methods for lessening that impact
- **S13.25** Identify organisms that require different environments
- **S13.26** Construct and maintain an aquarium/terrarium habitat
- **S13.27** Give examples of the adaptation of a species to its environment
- **S13.28** Explain how adaptation may contribute to survival, giving examples

HEREDITY AND EVOLUTION

- **S13.29** Match offspring with their parents
- **S13.30** Discuss similarities/differences between individuals within their own families

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S14.1** Identify major geological features of the earth's surface

EARTH CHANGES

- **S14.2** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **S14.3** Explain how the earth has changed over time
- **S14.4** Distinguish between forces that cause rapid change/slow change of the earth's surface

ANCIENT LIFE

- **S14.5** Compare ancient life with life today
- **S14.6** Begin to identify fossils as remains of prehistoric plants or animals
- **S14.7** Describe ways in which fossils can be used to acquire information
- **S14.8** Make a simulated fossil

NATURAL RESOURCES

- **S14.9** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **S14.10** Describe ways in which people waste natural resources and opportunities for conservation

WEATHER

- **S14.11** Begin to identify the concept of the water cycle
- **S14.12** Observe, describe, and record daily weather conditions over a period of time
- **S14.13** Discuss seasonal weather changes
- **S14.14** Identify cloud types and relate them to weather
- **S14.15** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **S14.16** Describe climatic zones of the earth: polar, temperate, tropic

SOLAR SYSTEM

- **S14.17** Identify the sun as the source of the earth's energy (light and heat)
- **S14.18** Describe a variety of objects in the sky, e.g., sun, moon
- **S14.19** Using models, describe the movements of the earth, sun, and moon

- **S14.20** Compare/contrast characteristics of the planets in our solar system
- **S14.21** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S15.1** Identify a simple problem
- **S15.2** Suggest tools that might be used to solve the problem
- **S15.3** Propose a solution
- **S15.4** Implement the proposed solution
- **S15.5** Communicate the results of this process
- **S15.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **S15.7** Communicate his/her findings about the product

ROLE OF SCIENCE AND TECHNOLOGY

- **S15.8** Describe examples of the use of science to explain the natural world
- **S15.9** Recognize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **S15.10** Distinguish between natural/manufactured objects
- **S15.11** Give examples of natural/manufactured objects

Content Standard F: Science in Personal and Social Perspectives

Please note that Content Standard F is covered in Standard C/Ecology.

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S17.1** Recognize that science has changed over time
- **S17.2** Examine differences in methods and equipment used in the past
- **S17.3** Recognize science as a career
- **S17.4** Give examples of scientists working in teams

Grade Two

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S21.1** Observe objects or events in a variety of ways using one or more of the senses
- **S21.2** Identify properties of an object, e.g., shape, color, size, texture
- **S21.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **S21.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **S21.5** Identify properties useful for classifying objects
- **S21.6** Group objects by the properties or similarities/differences
- **S21.7** Construct and use classification systems

INFERRING

- **S21.8** Suggest explanations for events based on observations

PREDICTING

- **S21.9** Forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **S21.10** Compare and order objects by length, area, weight, volume, etc.
- **S21.11** Measure properties of objects or events, e.g., weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **S21.12** Construct and use drawings, diagrams, charts, or graphs to transmit information learned from science experiences
- **S21.13** Verbally ask questions about, discuss, explain, or report observations

USING SPACE/TIME RELATIONS

- **S21.14** Describe an object's position in relation to other objects, e.g., above, below, beside
- **S21.15** Describe the motion, direction, and shape of an object compared to another object

DEFINING OPERATIONALLY

- **S21.16** Begin to state definitions of objects or events in terms of what the object is doing or what is occurring in the event.

FORMULATING HYPOTHESES

- **S21.17** Suggest questions or statements which can be tested
- **S21.18** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **S21.19** Suggest a question for investigation
- **S21.20** Conduct simple experiments
- **S21.21** Use simple equipment to gather data and extend the senses
- **S21.22** Utilize safe procedures while conducting investigations

RECOGNIZING VARIABLES

INTERPRETING DATA

- **S21.23** Construct a new explanation based on new information or revised data
- **S21.24** Use mathematics to interpret data
- **S21.25** Give examples of mathematics used in scientific inquiry, based on Math Curriculum Guidelines
- **S21.26** Understand that new information can lead to new discoveries

FORMULATING MODELS

- **S21.27** Create a mental, physical, or verbal representation of an idea, object, or event
- **S21.28** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S22.1** Demonstrate that all matter takes up space and has weight
- **S22.2** Differentiate among solids, liquids, and gases, giving examples of each
- **S22.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating

MATTER: WATER

- **S22.4** Describe water as a unique substance essential to living functions
- **S22.5** Predict ability of objects to float in water

MATTER: ELEMENTS

- **S22.6** Separate the components of a mixture

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S22.7** Define energy as the ability to do work
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- **S22.11** Explain a variety of ways in which electricity is used
- **S22.12** Construct electrical circuits using batteries, bulbs, wires

ENERGY: MAGNETISM

- **S22.13** Sort objects according to magnetic and non-magnetic properties
- **S22.14** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR

- **S22.15** Demonstrate the use of a lens, mirror, and prism with the path of light
- **S22.16** Begin to use terms: straight line of travel, reflection of an image
- **S22.17** Generate and identify different colors of pigment

ENERGY: SOUND

- **S22.18** Describe variations in sound, e.g., low/high, soft/loud
- **S22.19** Produce sound using vibration of objects
- **S22.20** Recognize variations in pitch and frequency
- **S22.21** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT

- **S22.22** Demonstrate heat as a change agent, e.g., cooking, melting
- **S22.23** Suggest ways in which heat is produced
- **S22.24** Measure temperature in appropriate units
- **S22.25** Begin to recognize the heat transfer mechanisms: conduction, convection, radiation

ENERGY: FORCE AND MACHINES

- **S22.26** Identify pushing or pulling on a object as a force
- **S22.27** Give examples of forces that move objects
- **S22.28** Begin to recognize gravity as a force
- **S22.29** Begin to recognize a simple machine
- **S22.30** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S23.1** Recognize the difference between living and non-living things
- **S23.2** Classify familiar objects as living or non-living
- **S23.3** Identify the basic needs of living things
- **S23.4** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **S23.5** Identify similarities/differences in physical characteristics of living things

MICROORGANISMS

PLANTS

- **S23.6** Identify the basic characteristics of plants
- **S23.7** Illustrate ways in which seeds can be dispersed

- **S23.8** Recognize the process of photosynthesis as a plant's ability to make its own food
- **S23.9** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **S23.10** Identify ways in which people use plants
- **S23.11** Understand that different parts of a plant have different functions

ANIMALS

- **S23.12** Compare similarities/differences among various groups of animals
- **S23.13** Give examples of ways in which animals have adapted to their environment
- **S23.14** Observe and describe animal behavior
- **S23.15** Identify a variety of animals that are meat eaters/plant eaters

ECOLOGY

- **S23.16** Define environment
- **S23.17** Explain characteristics of his/her environment
- **S23.18** Give examples of changes in environments
- **S23.19** List some effects of changes in environments
- **S23.20** Identify local plant and animal species
- **S23.21** Construct food chains/food webs
- **S23.22** Begin to recognize ways in which populations of plants and animals in a community interact with one another and their environment
- **S23.23** Explain the impact of one's personal life on the environment
- **S23.24** Identify and practice methods for lessening that impact
- **S23.25** Identify organisms that require different environments
- **S23.26** Construct and maintain an aquarium/terrarium habitat
- **S23.27** Give examples of the adaptation of a species to its environment
- **S23.28** Explain how adaptation may contribute to survival, giving examples

HEREDITY AND EVOLUTION

- **S23.29** Match offspring with their parents
- **S23.30** Discuss similarities/differences between individuals within their own families

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S24.1** Identify major geological features of the earth's surface

EARTH CHANGES

- **S24.2** Give examples of constructive/destructive forces on the earth's surface
- **S24.3** Explain how the earth has changed over time
- **S24.4** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **S24.5** Distinguish between forces that cause rapid change/slow change of the earth's surface

ANCIENT LIFE

- **S24.6** Compare ancient life with life today
- **S24.7** Identify fossils as remains of prehistoric plants or animals
- **S24.8** Describe ways in which fossils can be used to acquire information
- **S24.9** Make a simulated fossil

NATURAL RESOURCES

- **S24.10** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **S24.11** Describe ways in which people waste natural resources and opportunities for conservation

WEATHER

- **S24.12** Identify the concept of the water cycle
- **S24.13** Observe, describe, and record daily weather conditions over a period of time
- **S24.14** Discuss seasonal weather changes
- **S24.15** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **S24.16** Describe climatic zones of the earth: polar, temperate, tropic

SOLAR SYSTEM

- **S24.17** Identify the sun as the source of the earth's energy (light and heat)
- **S24.18** Describe a variety of objects in the sky, e.g., sun, moon
- **S24.19** Using models, describe the movements of the earth, sun, and moon

- **S24.20** Compare/contrast characteristics of the planets in our solar system
- **S24.21** Describe some scientific and technological discoveries resulting from space programs
- **S24.22** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S25.1** Identify a simple problem
- **S25.2** Suggest tools that might be used to solve the problem
- **S25.3** Propose a solution
- **S25.4** Implement the proposed solution
- **S25.5** Communicate the results of the process
- **S25.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **S25.7** Communicate his/her findings about the product

ROLE OF SCIENCE AND TECHNOLOGY

- **S25.8** Describe examples of the use of science to explain the natural world
- **S25.9** Recognize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **S25.10** Distinguish between natural/manufactured objects
- **S25.11** Give examples of natural/manufactured objects

Content Standard F: Science in Personal and Social Perspectives

Please note that Content Standard F is covered in Standard C/Ecology.

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S27.1** Recognize that science has changed over time
- **S27.2** Examine differences in methods and equipment used in the past
- **S27.3** Identify historical scientists and their contributions
- **S27.4** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups
- **S27.5** Recognize science as a career
- **S27.6** Give examples of scientists working in teams

Grade Three

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S31.1** Observe objects or events in a variety of ways using one or more of the senses
- **S31.2** Identify properties of an object, e.g., shape, color, size, texture
- **S31.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **S31.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **S31.5** Identify properties useful for classifying objects
- **S31.6** Group objects by the properties or similarities/differences
- **S31.7** Construct and use classification systems

INFERRING

- **S31.8** Suggest explanations for events based on observations

PREDICTING

- **S31.9** Forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **S31.10** Compare and order objects by length, area, weight, volume, etc.
- **S31.11** Measure properties of objects or events, e.g., weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **S31.12** Construct and use drawings, diagrams, charts, or graphs to transmit information learned from science experiences
- **S31.13** Verbally ask questions about, discuss, explain, or report observations

USING SPACE/TIME RELATIONS

- **S31.14** Describe an object's position in relation to other objects, e.g., above, below, beside
- **S31.15** Describe the motion, direction, and shape of an object compared to another object

DEFINING OPERATIONALLY

- **S31.16** Begin to state definitions of objects or events in terms of what the object is doing or what is occurring in the event.

FORMULATING HYPOTHESES

- **S31.17** Suggest questions or statements which can and cannot be tested
- **S31.18** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **S31.19** Suggest a question for investigation
- **S31.20** Conduct simple experiments
- **S31.21** Use simple equipment to gather data and extend the senses
- **S31.22** Utilize safe procedures while conducting investigations

RECOGNIZING VARIABLES

INTERPRETING DATA

- **S31.23** Construct a new explanation based on new information or revised data
- **S31.24** Use mathematics to interpret data
- **S31.25** Give examples of mathematics used in scientific inquiry, based on Math Curriculum Guidelines
- **S31.26** Understand that new information can lead to new discoveries.

FORMULATING MODELS

- **S31.27** Create a mental, physical, or verbal representation of an idea, object, or event
- **S31.28** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S32.1** Demonstrate that all matter takes up space and has weight
- **S32.2** Differentiate among solids, liquids, and gases, giving examples of each
- **S32.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating

MATTER: WATER

- **S32.4** Describe water as a unique substance essential to living functions and to many natural inorganic changes
- **S32.5** Predict ability of objects to float in water

MATTER: ELEMENTS

- **S32.6** Separate the components of a mixture

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S32.7** Define energy as the ability to do work
- **S32.8** Understand energy as a property of many substances
- **S32.9** Describe and practice methods of conserving energy

ENERGY: ELECTRICITY

- **S32.10** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber
- **S32.11** Explain a variety of ways in which electricity is used
- **S32.12** Construct electrical circuits using batteries, bulbs, wires

ENERGY: MAGNETISM

- **S32.13** Sort objects according to magnetic and non-magnetic properties
- **S32.14** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR

- **S32.15** Demonstrate the use of a lens, mirror, and prism with the path of light
- **S32.16** Begin to use terms: straight line of travel, reflection of an image
- **S32.17** Generate and identify different colors of pigment

ENERGY: SOUND

- **S32.18** Describe variations in sound, e.g., low/high, soft/loud
- **S32.19** Produce sound using vibration of objects
- **S32.20** Recognize variations in pitch and frequency
- **S32.21** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT

- **S32.22** Demonstrate heat as a change agent, e.g., cooking, melting
- **S32.23** Suggest ways in which heat is produced
- **S32.24** Measure temperature in appropriate units
- **S32.25** Begin to recognize the heat transfer mechanisms: conduction, convection, radiation

ENERGY: FORCE AND MACHINES

- **S32.26** Identify pushing or pulling on a object as a force
- **S32.27** Give examples of forces that move objects
- **S32.28** Recognize gravity as a force
- **S32.29** Recognize a simple machine
- **S32.30** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S33.1** Describe characteristics of living and non-living things
- **S33.2** Classify familiar objects as living or non-living
- **S33.3** State basic needs of living things
- **S33.4** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **S33.5** Identify similarities/differences in physical characteristics of living things
-

MICROORGANISMS

PLANTS

- **S33.6** Identify the basic characteristics of plants
- **S33.7** Illustrate ways in which seeds can be dispersed
- **S33.8** Recognize the process of photosynthesis as a plant's ability to make its own food
- **S33.9** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **S33.10** Identify ways in which people use plants
- **S33.11** Understand that different parts of a plant have different functions

ANIMALS

- **S33.12** Compare similarities/differences among various groups of animals
- **S33.13** Give examples of ways in which animals have adapted to their environment
- **S33.14** Observe and describe animal behavior
- **S33.15** Report the results of an investigation concerning animal behavior in response to stimuli, e.g., external and internal cues
- **S33.16** Identify a variety of animals that are meat eaters/plant eaters

ECOLOGY

- **S33.17** Define environment
- **S33.18** Explain characteristics of his/her environment
- **S33.19** Give examples of changes in environments
- **S33.20** List some effects of changes in environments
- **S33.21** Identify local plant and animal species
- **S33.22** Construct food chains/food webs
- **S33.23** Recognize ways in which populations of plants and animals in a community interact with one another and their environment
- **S33.24** Explain the impact of one's personal life on the environment
- **S33.25** Identify and practice methods for lessening that impact
- **S33.26** Identify organisms that require different environments
- **S33.27** Construct and maintain an aquarium/terrarium habitat
- **S33.28** Give examples of the adaptation of a species to its environment
- **S33.29** Explain how adaptation may contribute to survival, giving examples
- **S33.30** Define and correctly use terms: producers, consumers, decomposers

HEREDITY AND EVOLUTION

- **S33.31** Match offspring with their parents
- **S33.32** Discuss similarities/differences between individuals within their own families

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S34.1** Identify major geological features of the earth's surface
- **S34.2** Begin to distinguish between rocks and minerals
- **S34.3** Begin to classify rocks by method of formation: igneous, metamorphic, sedimentary
- **S34.4** Test minerals for color, hardness, crystalline structure, magnetism, etc.
- **S34.5** Investigate properties of soils
- **S34.6** Begin to identify and describe the layers of the solid earth

EARTH CHANGES

- **S34.7** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **S34.8** Give examples of constructive/destructive forces on the earth's surface
- **S34.9** Distinguish between forces that cause rapid change/slow change of the earth's surface
- **S34.10** Explain how the earth has changed over time

ANCIENT LIFE

- **S34.11** Compare ancient life with life today
- **S34.12** Identify fossils as remains of prehistoric plants or animals
- **S34.13** Describe ways in which fossils can be used to acquire information

WEATHER

- **S34.14** Observe, describe, and record daily weather conditions over a period of time
- **S34.15** Discuss seasonal weather changes
- **S34.16** Identify cloud types and relate them to weather
- **S34.17** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **S34.18** Describe climatic zones of the earth: polar, temperate, tropic

NATURAL RESOURCES

- **S34.19** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **S34.20** Describe ways in which people waste natural resources and opportunities for conservation

SOLAR SYSTEM

- **S34.21** Identify the sun as the source of the earth's energy (light and heat)
- **S34.22** Describe a variety of objects in the sky, e.g., sun, moon, clouds
- **S34.23** Using models, describe the movements of the earth, sun
- **S34.24** Compare/contrast characteristics of the planets in our solar system
- **S34.25** Describe some scientific and technological discoveries resulting from space programs
- **S34.26** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S35.1** Identify a simple problem
- **S35.2** Suggest tools that might be used to solve the problem
- **S35.3** Propose a solution
- **S35.4** Implement the proposed solution
- **S35.5** Communicate the results of the process
- **S35.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **S35.7** Communicate his/her findings about the product

ROLE OF SCIENCE AND TECHNOLOGY

- **S35.8** Describe examples of the use of science to explain the natural world
- **S35.9** Recognize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **S35.10** Distinguish between natural/manufactured objects
- **S35.11** Give examples of natural/manufactured objects

Content Standard F: Science in Personal and Social Perspectives

Please note that Content Standard F is covered in Standard C/Ecology.

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S37.1** Recognize that science has changed over time
- **S37.2** Examine differences in methods and equipment used in the past
- **S37.3** Identify historical scientists and their contributions
- **S37.4** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups
- **S37.5** Recognize science as a career
- **S37.6** Give examples of scientists working in teams

Grade Four

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S41.1** Observe objects or events in a variety of ways using one or more of the senses (3.2.4A/B)
- **S41.2** Identify properties of an object, e.g., shape, color, size, texture (3.2.4A/B)
- **S41.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers (3.1.4D, 3.2.4A/B)
- **S41.4** Observe objects or events by counting, comparing, estimating, and measuring (3.1.4D, 3.2.4A/B)

CLASSIFYING

- **S41.5** Identify properties useful for classifying objects (3.1.4A/B)
- **S41.6** Group objects by their properties or similarities/differences (3.1.4A/B)
- **S41.7** Construct and use classification systems (3.1.4A/B)

INFERRING

- **S41.8** Suggest explanations for events based on observations (3.2.4A/B)

PREDICTING

- **S41.9** Forecast a future event based on prior experience, e.g., observation, inference, or experiment (3.2.4A)

MEASURING

- **S41.10** Compare and order objects by length, area, weight, volume, etc. (3.1.4D, 3.2.4A/B)
- **S41.11** Measure properties of objects or events, e.g., weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments (3.1.4D, 3.2.4A/B)

COMMUNICATING

- **S41.12** Construct and use drawings, diagrams, charts, or graphs to transmit information learned from science experiences (3.1.4D, 3.2.4A/B)
- **S41.13** Verbally ask questions about, discuss, explain, or report observations (3.2.4A/B)

USING SPACE/TIME RELATIONS

- **S41.14** Describe an object's position in relation to other objects, e.g., above, below, beside (3.1.4B, 3.2.4B)
- **S41.15** Describe the motion, direction, and shape of an object compared to another object (3.1.4B, 3.2.4B)

DEFINING OPERATIONALLY

- **S41.16** Begin to state definitions of objects or events in terms of what the object is doing or what is occurring in the event (3.1.4B, 3.2.4A/B)

FORMULATING HYPOTHESES

- **S41.17** Suggest questions or statements which can and cannot be tested (3.2.4C)
- **S41.18** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions (3.2.4C)

EXPERIMENTING

- **S41.19** Suggest a question for investigation (3.2.4C)
- **S41.20** Conduct simple experiments (3.2.4C)
- **S41.21** Use simple equipment to gather data and extend the senses (3.2.4C, 3.7.4B)
- **S41.22** Utilize safe procedures while conducting investigations (3.2.4C)

IDENTIFYING VARIABLES

- **S41.23** Tell what changes in an experiment (3.2.4B/C)

INTERPRETING DATA

- **S41.24** State in his/her own words information derived from a science investigation and from prior knowledge (3.2.4A/B)
- **S41.25** Construct a new explanation based on new information or revised data (3.1.4D, 3.2.4A/B)
- **S41.26** Use mathematics to interpret data (3.1.4D, 3.2.4A/B)
- **S41.27** Give examples of mathematics used in scientific inquiry, based on Math Curriculum Guidelines (3.1.4D, 3.2.4A/B)
- **S41.28** Understand that new information can lead to new discoveries (3.2.4A/B)

FORMULATING MODELS

- **S41.29** Create a mental, physical, or verbal representation of an idea, object, or event (3.1.4A/B/C/D, 3.2.4B)
- **S41.30** Use models to describe and explain interrelationships of ideas, objects, or events (3.1.4A/B/C/D, 3.2.4B)

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S42.1** Demonstrate that all matter takes up space and has weight (3.1.4E, 3.4.4A)
- **S42.2** Differentiate among solids, liquids, and gases, giving examples of each (3.1.4E, 3.4.4A, 3.5.4D)
- **S42.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating (3.1.4E, 3.4.4A, 3.5.4D)

MATTER: WATER

- **S42.4** Describe water as a unique substance essential to living functions and to many natural inorganic changes (3.1.4E, 3.5.4D)
- **S42.5** Predict ability of objects to float in water (3.1.4E, 3.5.4D)
- **S42.6** Use the pH scale to test for alkalinity of acidity (3.1.4E, 3.5.4D)

MATTER: ELEMENTS

- **S42.7** Separate the components of a mixture (3.1.4A/E)

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S42.8** Define energy as the ability to do work (3.1.4E, 3.4.4B, 3.5.4B)
- **S42.9** Understand energy as a property of many substances (3.1.4E, 3.4.4B, 3.5.4B)
- **S42.10** Describe and practice methods of conserving energy (3.1.4E, 3.4.4B, 3.5.4B, 3.6.4C)

ENERGY: ELECTRICITY

- **S42.11** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber (3.1.4E, 3.4.4B)
- **S42.12** Explain a variety of ways in which electricity is used (3.1.4E, 3.4.4B)
- **S42.13** Construct electrical circuits and predict performance of circuits using batteries, bulbs, wires (3.1.4E, 3.4.4B)
- **S42.14** Begin to understand the classification of materials as conductors or non-conductors of electricity (3.1.4E, 3.4.4B)

ENERGY: MAGNETISM

- **S42.15** Sort objects according to magnetic and non-magnetic properties (3.1.4E, 3.4.4B)
- **S42.16** Predict attraction and repulsion between magnetic poles (3.1.4E, 3.4.4B)

ENERGY: LIGHT AND COLOR

- **S42.17** Demonstrate the use of a lens, mirror, and prism with the path of light (3.1.4E, 3.4.4B)
- **S42.18** Begin to use terms: straight line of travel, reflection of an image (3.1.4E, 3.4.4B)
- **S42.19** Generate and identify different colors of pigment (3.1.4E, 3.4.4B)

ENERGY: SOUND

- **S42.20** Describe variations in sound, e.g., low/high, soft/loud (3.1.4E, 3.4.4B)
- **S42.21** Produce sound using vibration of objects (3.1.4E, 3.4.4B)
- **S42.22** Recognize variations in pitch and frequency (3.1.4E, 3.4.4B)
- **S42.23** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer (3.1.4E, 3.4.4B)

ENERGY: HEAT

- **S42.24** Demonstrate heat as a change agent, e.g., cooking, melting (3.1.4E, 3.4.4B)
- **S42.25** Suggest ways in which heat is produced (3.1.4E, 3.4.4B, 3.5.4B)
- **S42.26** Measure temperature in appropriate units (3.1.4E, 3.4.4B)
- **S42.27** Begin to recognize the heat transfer mechanisms: conduction, convection, radiation (3.1.4E, 3.4.4B)

ENERGY: FORCE AND MACHINES

- **S42.28** Identify pushing or pulling on a object as a force (3.1.4E, 3.4.4B/C)
- **S42.29** Give examples of forces that move objects (3.1.4E, 3.4.4B/C)
- **S42.30** Recognize gravity as a force (3.1.4E, 3.4.4B/C)
- **S42.31** Identify a simple machine (3.1.4E, 3.4.4B/C)
- **S42.32** Demonstrate and describe the use of simple machines in everyday life (3.1.4B/E, 3.4.4B/C)

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S43.1** Describe characteristics of living and non-living things (3.1.4C, 3.3.4A/B)
- **S43.2** Classify familiar objects as living or non-living (3.1.4C, 3.3.4A/B)
- **S43.3** Identify basic needs of living things (3.1.4C, 3.3.4A/B)
- **S43.4** Identify the cell as the basic unit of structure of living things (3.1.4C, 3.3.4A/B)
- **S43.5** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human (3.1.4C, 3.3.4A/B)
- **S43.6** Identify similarities/differences in physical characteristics of living things, using them to construct a classification system (3.1.4C, 3.3.4A/B/C)

MICROORGANISMS

PLANTS

- **S43.7** Identify the basic characteristics of plants (3.1.4C, 3.3.4A/B)
- **S43.8** Illustrate ways in which seeds can be dispersed (3.1.4C, 3.3.4A/B)
- **S43.9** Recognize the process of photosynthesis as a plant's ability to make its own food (3.1.4C, 3.3.4A/B)
- **S43.10** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer (3.1.4C, 3.3.4A/B)
- **S43.11** Identify ways in which people use plants (3.1.4C, 3.3.4A/B, 3.6.4C)
- **S43.12** Understand that different parts of a plant have different functions (3.1.4C, 3.3.4A/B)

ANIMALS

- **S43.13** Compare similarities/differences among various groups of animals (3.3.4A/B/C)
- **S43.14** Give examples of ways in which animals have adapted to their environment (3.1.4E, 3.3.4A/B/C)
- **S43.15** Observe and describe animal behavior (3.1.4C, 3.3.4A/B)
- **S43.16** Report the results of an investigation concerning animal behavior in response to stimuli**,** e.g., external and internal cues (3.1.4C/E, 3.3.4A/B)
- **S43.17** Identify a variety of animals that are meat eaters/plant eaters (3.3.4A/B)

ECOLOGY

- **S43.18** Define environment (3.3.4A/B, 3.6.4A)
- **S43.19** Explain characteristics of his/her environment (3.3.4A/B, 3.6.4A)
- **S43.20** Give examples of changes in environments (3.1.4E, 3.3.4A/B, 3.6.4A)
- **S43.21** List some effects of changes in environments (3.1.4E, 3.3.4A/B, 3.5.4B, 3.6.4A, 3.6.4C)
- **S43.22** Identify local plant and animal species, describing their natural histories (3.1.4E, 3.3.4A/B/C, 3.6.4A)
- **S43.23** Construct food chains/food webs (3.3.4A/B, 3.6.4A)
- **S43.24** Recognize ways in which populations of plants and animals in a community interact with one another and their environment (3.1.4E, 3.3.4A/B/C, 3.6.4A)
- **S43.25** Explain the impact of one's personal life on the environment (3.3.4A/B, 3.5.4B, 3.6.4A/C)
- **S43.26** Identify and practice methods for lessening that impact (3.3.4A/B, 3.5.4B, 3.6.4A/C)
- **S43.27** Identify organisms that require different environments (3.3.4A/B/C, 3.6.4A)
- **S43.28** Construct and maintain an aquarium/terrarium habitat (3.3.4A/B, 3.6.4A)
- **S43.29** Give examples of the adaptation of a species to its environment (3.1.4E, 3.3.4A/B/C, 3.6.4A)
- **S43.30** Explain how adaptation may contribute to survival, giving examples (3.1.4E, 3.3.4A/B/C, 3.6.4A)
- **S43.31**Define and correctly use terms: producers, consumers, decomposers (3.3.4A/B, 3.6.4A)

HEREDITY AND EVOLUTION

- **S43.32** Match offspring with their parents (3.3.4A/B/C/D)
- **S43.33** Discuss similarities/differences between individuals within their own families (3.1.4C, 3.3.4A/B/C/D)
- **S43.34** Describe how plants and animals have both structural and behavioral adaptations which help them survive (3.1.4C/E, 3.3.4A/B/C/D)

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S44.1** Distinguish between rocks and minerals (3.1.4C, 3.5.4A)
- **S44.2** Classify rocks by method of formation: igneous, sedimentary, metamorphic (3.1.4C, 3.5.4A)
- **S44.3** Identify major geological features of the earth's surface (3.1.4C, 3.5.4A)

- **S44.4** Test minerals for color, hardness, crystalline structure, magnetism, etc. (3.1.4C, 3.5.4A)
- **S44.5** Investigate properties of soils (3.1.4C, 3.5.4A)
- **S44.6** Identify and describe the layers of the solid earth (3.1.4C, 3.5.4A)

EARTH CHANGES

- **S44.7** Give examples of constructive/destructive forces on the earth's surface (3.5.4A/D)
- **S44.8** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans (3.5.4A/D)
- **S44.9** Distinguish between forces that cause rapid change/slow change of the earth's surface (3.5.4A)
- **S44.10** Explain how the earth has changed over time (3.5.4A)
- **S44.11** Begin to identify the process of plate tectonics (3.5.4A)

ANCIENT LIFE

- **S44.12** Compare ancient life with life today (3.5.4A)
- **S44.13** Identify fossils as remains of prehistoric plants or animals (3.5.4A)
- **S44.14** Describe ways in which fossils can be used to acquire information (3.5.4A)
- **S44.15** Make a simulated fossil (3.5.4A)

NATURAL RESOURCES

- **S44.16** List natural resources, e.g., fossil fuels, water, air, metal ores, soil (3.5.4A/B/D, 3.6.4C)
- **S44.17** Describe ways in which people waste natural resources and opportunities for conservation (3.5.4A/B, 3.6.4C)

WEATHER

- **S44.18** Describe the water cycle (3.1.4C, 3.5.4A/C/D)
- **S44.19** Observe, describe, and record daily weather conditions over a period of time (3.5.4A/C/D)
- **S44.20** Discuss seasonal weather changes (3.5.4A/C/D)
- **S44.21** Identify cloud types and relate them to weather (3.5.4A/C/D)
- **S44.22** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation (3.5.4A/C/D)
- **S44.23** Describe climatic zones of the earth: polar, temperate, tropic (3.5.4A/C/D)
- **S44.24** Begin to identify weather map symbols and their uses (3.5.4A/C/D)

SOLAR SYSTEM

- **S44.25** Identify the sun as the source of the earth's energy (light and heat) (3.4.4D, 3.5.4A/B)
- **S44.26** Describe a variety of objects in the sky, e.g., sun, moon (3.4.4D, 3.5.4A)
- **S44.27** Using models, describe the movements of the earth, sun, and moon (3.4.4D, 3.5.4A)
- **S44.28** Begin to describe the effects of these movements, e.g., phases of the moon, eclipses (3.4.4D, 3.5.4A)
- **S44.29** Identify tides as earth-moon-sun gravitational attraction (3.4.4D, 3.5.4A)
- **S44.30** Compare/contrast characteristics of the planets in our solar system (3.4.4D, 3.5.4A)
- **S44.31** Describe some scientific and technological discoveries resulting from space programs (3.4.4D, 3.5.4A)
- **S44.32** Identify major structures found in the universe, e.g., stars, constellations, galaxies (3.4.4D, 3.5.4A)

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S45.1** Identify a simple problem (3.2.4C/D, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.2** Suggest tools that might be used to solve the problem (3.2.4C/D, 3.6.4B/C, 3.7.4A/B/C/D/E, 3.8.4C)
- **S45.3** Propose a solution (3.2.4C/D, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.4** Implement the proposed solution (3.2.4C/D, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.5** Communicate the results of the process (3.2.4C/D, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.6** Demonstrate the ability to manipulate a technological product, e.g., software (3.2.4C/D, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.7** Communicate his/her findings about the product (3.2.4C/D, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)

ROLE OF SCIENCE AND TECHNOLOGY

- **S45.8** Describe examples of the use of science to explain the natural world (3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.9** Recognize a variety of tools/equipment used by scientists (3.6.4B/C, 3.7.4A/B/C/D/E, 3.8.4C)

DISTINGUISHING OBJECTS

- **S45.10** Distinguish between natural/manufactured objects (3.1.4A, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)
- **S45.11** Give examples of natural/manufactured objects (3.1.4A, 3.6.4B/C, 3.7.4C/D/E, 3.8.4C)

Content Standard F: Science in Personal and Social Perspectives

Please note that Content Standard F is covered in Standard C/Ecology.

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S47.1** Recognize that science has changed over time (3.6.4C, 3.8.4A/B/C)
- **S47.2** Examine differences in methods and equipment used in the past (3.6.4C, 3.8.4A/B/C)
- **S47.3** Identify historical scientists and their contributions (3.6.4C, 3.8.4A/B/C)
- **S47.4** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups (3.6.4C, 3.8.4A/B/C)
- **S47.5** Recognize science as a career (3.6.4C, 3.8.4A/B/C)
- **S47.6** Give examples of scientists working in teams (3.6.4C, 3.8.4A/B/C)

Grade Five

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S51.1** Observe objects or events in a variety of ways using one or more of the senses
- **S51.2** Identify properties of an object, e.g., shape, color, size, texture
- **S51.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **S51.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **S51.5** Identify properties useful for classifying objects
- **S51.6** Group objects by the properties or similarities/differences
- **S51.7** Construct and use classification systems

INFERRING

- **S51.8** Suggest explanations for events based on observations
- **S51.9** Distinguish between an observation and an inference

PREDICTING

- **S51.10** Forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **S51.11** Compare and order objects by length, area, weight, volume, etc.
- **S51.12** Measure properties of objects or events, e.g., volume, mass, weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **S51.13** Construct and use written reports, drawings, diagrams, graphs, or charts to transmit information learned from science experiences
- **S51.14** Verbally ask questions about, discuss, explain, or report observations
- **S51.15** After an investigation, report the question tested, the experimental design used, results, and conclusions drawn, e.g., using tables or graphs

USING SPACE/TIME RELATIONS

- **S51.16** Describe an object's position in relation to other objects, e.g., above, below, beside
- **S51.17** Describe the motion, direction, shape, spatial arrangements, and symmetry of an object compared to another object

DEFINING OPERATIONALLY

- **S51.18** State definitions of objects or events in terms of what the object is doing or what is occurring in the event
- **S51.19** State definitions of objects or events based on observable characteristics

FORMULATING HYPOTHESES

- **S51.20** Identify questions or statements which can and cannot be tested
- **S51.21** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **S51.22** Suggest a question for investigation
- **S51.23** Design an investigation to test a hypothesis
- **S51.24** Conduct simple experiments
- **S51.25** Use simple equipment to gather data and extend the senses
- **S51.26** Use mathematics in the inquiry
- **S51.27** Utilize safe procedures while conducting investigations

IDENTIFYING VARIABLES

- **S51.28** Tell what changes in an experiment

INTERPRETING DATA

- **S51.29** State in his/her own words information derived from a science investigation
- **S51.30** Use mathematics to interpret data
- **S51.31** Give examples of the use of mathematics in scientific inquiry
- **S51.32** Construct an explanation from the data and from prior knowledge, using logic and critical thinking skills
- **S51.33** Revise interpretations of data based on new information or revised data

FORMULATING MODELS

- **S51.34** Create a mental, physical, or verbal representation of an idea, object, or event
- **S51.35** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S52.1** Demonstrate that all matter takes up space and has weight
- **S52.2** Differentiate among solids, liquids, and gases, giving examples of each
- **S52.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating

MATTER: WATER

- **S52.4** Describe water as a unique substance essential to living functions and to many natural inorganic changes
- **S52.5** Predict ability of objects to float in water
- **S52.6** Use the pH scale to test for acidity or alkalinity of a water solution

MATTER: ELEMENTS

- **S52.7** Identify the properties of substances
- **S52.8** Group substances with common properties
- **S52.9** Separate the components of mixtures

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S52.10** Define energy as the ability to do work
- **S52.11** Understand energy as a property of many substances
- **S52.12** Describe and practice methods of conserving energy

ENERGY: ELECTRICITY

- **S52.13** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber
- **S52.14** Explain a variety of ways in which electricity is used
- **S52.15** Construct electrical circuits and predict performance of variables using batteries, bulbs, wires
- **S52.16** Test and classify materials as conductors or non-conductors of electricity

ENERGY: MAGNETISM

- **S52.17** Describe and demonstrate properties of magnetism
- **S52.18** Sort objects according to magnetic and non-magnetic properties
- **S52.19** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR

- **S52.20** Demonstrate the use of a lens, mirror, and prism with the path of light
- **S52.21** Correctly use terms: straight line of travel, reflection of an image
- **S52.22** Generate and identify different colors of pigment

ENERGY: SOUND

- **S52.23** Describe variations in sound, e.g., low/high, soft/loud
- **S52.24** Produce sound using vibration of objects
- **S52.25** Recognize variations in pitch and frequency
- **S52.26** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT

- **S52.27** Demonstrate heat as a change agent, e.g., cooking, melting
- **S52.28** Suggest ways in which heat is produced
- **S52.29** Measure temperature in appropriate units
- **S52.30** Explain temperature as molecular motion
- **S52.31** Illustrate the heat transfer mechanisms: conduction, convection, radiation
- **S52.32** Explain the movement of heat from a warmer object to a cooler object

ENERGY: FORCE AND MACHINES

- **S52.33** Identify pushing or pulling on an object as a force
- **S52.34** Give examples of forces that move objects
- **S52.35** Define inertia as the resistance to change from an outside force
- **S52.36** Demonstrate the direction of motion and speed of an object
- **S52.37** Identify, construct, and use simple machines
- **S52.38** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S53.1** Describe characteristics of living and non-living things
- **S53.2** Classify familiar objects as living or non-living

- **S53.3** State basic needs of living things
- **S53.4** Identify the cell as the basic unit of structure of living things
- **S53.5** Describe the levels of organization in living systems for structure and function, e.g., cells, organs, organ systems
- **S53.6** Give examples of specialized cells, tissues, and organs, explaining their functions
- **S53.7** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **S53.8** Identify similarities/differences in physical characteristics of living things, using them to construct a classification system

MICROORGANISMS

PLANTS

- **S53.9** Identify the basic characteristics of plants
- **S53.10** Describe the plant processes: photosynthesis, transpiration, respiration
- **S53.11** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **S53.12** Identify ways in which people use plants

ANIMALS

- **S53.13** Compare similarities/differences among various groups of animals
- **S53.14** Give examples of ways in which animals have adapted to their environment
- **S53.15** Observe and describe animal behavior
- **S53.16** Report the results of an investigation concerning animal behavior in response to stimuli**,** e.g., external and internal cues
- **S53.17** Identify a variety of animals that are meat eaters/plant eaters
- **S53.18** Explain the difference between plant eaters and meat eaters
- **S53.19** Describe basic characteristics of animal groups, e.g., kingdoms
- **S53.20** Explain how animal structures relate to functions

ECOLOGY

- **S53.21** Define environment
- **S53.22** Explain characteristics of his/her environment
- **S53.23** Give examples of changes in environments
- **S53.24** List some effects of changes in environments
- **S53.25** List risks to the environment resulting from natural, chemical, biological, or other hazards
- **S53.26** Suggest methods for reducing risk in one of these areas
- **S53.27** Identify local plant and animal species, describing their natural histories
- **S53.28** Construct food chains/food webs illustrating energy flow in an ecosystem
- **S53.29** Define and correctly use the terms: producers, consumers, decomposers

- **S53.30** Describe ways in which populations of plants and animals in a community interact with one another and their environment
- **S53.31** Give examples of the adaptation of a species to its environment
- **S53.32** Explain how adaptation may contribute to survival, giving examples
- **S53.33** Explain the impact of one's personal life on the environment
- **S53.34** Identify and practice methods for lessening that impact
- **S53.35** Describe ways in which the supply of resources limit the growth of a population
- **S53.36** Identify organisms that require different environments, explaining how and why their environments are unique from others
- **S53.37** Discuss the positive/negative effects of environmental policies and practices in the local community
- **S53.38** Construct and maintain an aquarium/terrarium habitat

HEREDITY AND EVOLUTION

- **S53.39** Describe reproduction as essential to survival of a species
- **S53.40** Explain reproduction in plants and animals
- **S53.41** Define and use the terms correctly: genes, chromosomes
- **S53.42** Match offspring with their parents
- **S53.43** Discuss similarities/differences between individuals within their own families
- **S53.44** Identify human traits which are inherited, e.g., eye color, hair color, ear lobe attachment
- **S53.45** List internal/external conditions needed for survival

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S54.1** Identify major geological features of the earth's surface
- **S54.2** Identify and describe the layers of the solid earth
- **S54.3** Test minerals for color, hardness, crystalline structure, magnetism, etc.
- **S54.4** Classify rocks by their method of formation: igneous, sedimentary, metamorphic
- **S54.5** Distinguish between rocks and minerals
- **S54.6** Investigate properties of soils

EARTH CHANGES

- **S54.7** Explain how the earth has changed over time
- **S54.8** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **S54.9** Distinguish between forces that cause rapid change/slow change of the earth's surface, citing examples of each
- **S54.10** Explain and illustrate how maintains, valleys, and oceans are formed
- **S54.11** Give examples of constructive/destructive forces on the earth's surface
- **S54.12** Distinguish between past and present earth processes
- **S54.13** Describe the process of plate tectonics

ANCIENT LIFE

- **S54.14** Compare ancient life with life today
- **S54.15** Identify fossils as remains of prehistoric plants or animals
- **S54.16** Describe ways in which fossils can be used to acquire information
- **S54.17** Describe techniques used to acquire information
- **S54.18** Suggest reasons for the extinction of a population
- **S54.19** Discuss circumstances which may affect the rate of extinction of a population

NATURAL RESOURCES

- **S54.20** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **S54.21** Distinguish between renewable and non-renewable resources
- **S54.22** Describe ways in which people waste natural resources and opportunities to conserve them

WEATHER

- **S54.23** Observe, describe, and record daily weather conditions over a period of time
- **S54.24** Discuss and chart seasonal weather changes
- **S54.25** Interpret a weather map
- **S54.26** Identify the concept of the water cycle as applied to daily weather conditions
- **S54.27** Identify cloud types and relate them to weather
- **S54.28** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **S54.29** Identify seasonal variations
- **S54.30** Describe climatic zones of the earth: polar, temperate, tropic

SOLAR SYSTEM

- **S54.31** Identify the sun as the source of the earth's energy (light and heat)
- **S54.32** Describe a variety of objects in the sky, e.g., sun, moon, clouds
- **S54.33** Using models, describe the movements of the earth, sun, and moon
- **S54.34** Describe the effects of these movements, e.g., phases of the moon, eclipses
- **S54.35** Explain tides as earth-moon-sun gravitational attraction
- **S54.36** Compare/contrast characteristics of the planets in our solar system
- **S54.37** Describe some scientific and technological discoveries resulting from space programs
- **S54.38** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S55.1** Identify a simple problem
- **S55.2** Suggest tools that might be used to solve the problem
- **S55.3** Propose or design a solution
- **S55.4** Implement the proposed solution
- **S55.5** Communicate the results of this process
- **S55.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **S55.7** Communicate his/her findings about the product
- **S55.8** List benefits and consequences of technological solutions
- **S55.9** Describe factors that limit technological solutions

ROLE OF SCIENCE AND TECHNOLOGY

- **S55.10** Give examples of the use of technology in scientific inquiry
- **S55.11** Describe examples of using science to explain the natural world
- **S55.12** Recognize and utilize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **S55.13** Distinguish between natural/manufactured objects
- **S55.14** Give examples of natural/manufactured objects

Content Standard F: Science in Personal and Social Perspectives

Please note that some areas of Content Standard F are covered in Standard C/Ecology.

SCIENCE AND SOCIETY

- **S56.1** Give examples of the influence of science on society
- **S56.2** Describe current research projects in a scientific field
- **S56.3** Suggest the influence the research may have on society
- **S56.4** Describe a current scientific inquiry which has created ethical conflicts
- **S56.5** Research ethical codes for research involving humans
- **S56.6** List situations in which science and technology are unable to solve human problems

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S57.1** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups
- **S57.2** Identify examples of contributions made by women, minorities, and people of other nations, e.g., Curie, Carver, Lister, Pasteur, Edison
- **S57.3** Identify major scientific milestones that have revolutionized thinking, e.g., the contributions of Mendel, Rutherford, Lavoisier, Newton, Galileo, and Darwin
- **S57.4** Describe the challenges faced by any of these individuals, and the challenges faced by scientists today
- **S57.5** Trace historical developments in science, linking them to contemporary counterparts, e.g., the work of Mendel, Rutherford, and the Wright brothers
- **S57.6** Compare/contrast how science and technology have changed over time,
- **S57.7** Understand that scientific and technological achievements build on one another, e.g., the use of telescopes from their original development to today
- **S57.8** Recognize science and technology as a source of various career opportunities, exploring talents and qualities needed, the variety of settings for employment, and various projects undertaken by scientists and engineers
- **S57.9** Give examples of projects in which scientists work in teams with other scientists or with engineers

Grade Six

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S61.1** Observe objects or events in a variety of ways using one or more of the senses
- **S61.2** Identify properties of an object, e.g., shape, color, size, texture
- **S61.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **S61.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **S61.5** Identify properties useful for classifying objects
- **S61.6** Group objects by the properties or similarities/differences
- **S61.7** Construct and use classification systems

INFERRING

- **S61.8** Suggest explanations for events based on observations
- **S61.9** Distinguish between an observation and an inference

PREDICTING

- **S61.10** Forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **S61.11** Compare and order objects by length, area, weight, volume, etc.
- **S61.12** Measure properties of objects or events, e.g., volume, mass, weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **S61.13** Construct and use written reports, drawings, diagrams, graphs, or charts to transmit information learned from science experiences

- **S61.14** Verbally ask questions about, discuss, explain, or report observations
- **S61.15** After an investigation, report the question tested, the experimental design used, results, and conclusions drawn, e.g., using tables or graphs

USING SPACE/TIME RELATIONS

- **S61.16** Describe an object's position in relation to other objects, e.g., above, below, beside
- **S61.17** Describe the motion, direction, shape, spatial arrangements, and symmetry of an object compared to another object

DEFINING OPERATIONALLY

- **S61.18** State definitions of objects or events in terms of what the object is doing or what is occurring in the event
- **S61.19** State definitions of objects or events based on observable characteristics

FORMULATING HYPOTHESES

- **S61.20** Identify questions or statements which can and cannot be tested
- **S61.21** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **S61.22** Suggest a question for investigation
- **S61.23** Design an investigation to test a hypothesis
- **S61.24** Conduct simple experiments
- **S61.25** Use simple equipment to gather data and extend the senses
- **S61.26** Use mathematics in the inquiry
- **S61.27** Utilize safe procedures while conducting investigations

RECOGNIZING VARIABLES

- **S61.28** Identify the independent (manipulated) variable, the dependent (responding) variable, and the variables held constant in an investigation
- **S61.29** Control the variables in an investigation

INTERPRETING DATA

- **S61.30** Organize and state in his/her own words information derived from a science investigation
- **S61.31** Use mathematics to interpret data
- **S61.32** Give examples of the use of mathematics in scientific inquiry
- **S61.33** Construct an explanation from the data and from prior knowledge, using logic and critical thinking skills

- **S61.34** Revise interpretations of data based on new information or revised data
- **S61.35** Understand that scientists question the work and data of other scientists; prior interpretations are replaced by better interpretations

FORMULATING MODELS

- **S61.36** Create a mental, physical, or verbal representation of an idea, object, or event
- **S61.37** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S62.1** Demonstrate that all matter takes up space and has weight
- **S62.2** Differentiate among solids, liquids, and gases, giving examples of each
- **S62.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating
- **S62.4** Define density as mass per unit volume
- **S62.5** Distinguish between chemical and physical changes

MATTER: WATER

- **S62.6** Describe water as a unique substance essential to living functions and to many natural inorganic changes
- **S62.7** Predict ability of objects to float in water
- **S62.8** Use the pH scale to test for acidity or alkalinity of a water solution

MATTER: ELEMENTS

- **S62.9** Identify substances as elements, compounds, or mixtures
- **S62.10** Identify the properties of substances
- **S62.11** Group substances with common properties
- **S62.12** Separate the components of mixtures

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S62.13** Define energy as the ability to do work
- **S62.14** Understand energy as a property of many substances
- **S62.15** Describe and practice methods of conserving energy

ENERGY: ELECTRICITY

- **S62.16** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber
- **S62.17** Explain a variety of ways in which electricity is used
- **S62.18** Construct electrical circuits and predict performance of variables using batteries, bulbs, wires
- **S62.19** Test and classify materials as conductors or non-conductors of electricity

ENERGY: MAGNETISM

- **S62.20** Describe and demonstrate properties of magnetism
- **S62.21** Sort objects according to magnetic and non-magnetic properties
- **S62.22** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR

- **S62.23** Explain the mechanics of sight
- **S62.24** Predict, demonstrate, and describe the effects of lenses, mirrors, and prisms on the path of light
- **S62.25** Demonstrate and use terms correctly: straight line of travel, reflection, refraction, absorption
- **S62.26** Generate and identify different colors of the spectrum

ENERGY: SOUND

- **S62.27** Describe variations in sound, e.g., low/high, soft/loud
- **S62.28** Produce sound using vibration of objects
- **S62.29** Recognize variations in pitch and frequency
- **S62.30** Begin to describe the relationship between pitch and frequency
- **S62.31** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT

- **S62.32** Demonstrate heat as a change agent, e.g., cooking, melting
- **S62.33** Suggest ways in which heat is produced
- **S62.34** Measure temperature in appropriate units

- **S62.35** Explain temperature as molecular motion
- **S62.36** Illustrate the heat transfer mechanisms: conduction, convection, radiation
- **S62.37** Explain the movement of heat from a warmer object to a cooler object

ENERGY: FORCE AND MACHINES

- **S62.38** Identify pushing or pulling on an object as a force
- **S62.39** Give examples of forces that move objects
- **S62.40** Define inertia as the resistance to change from an outside force
- **S62.41** Demonstrate the direction of motion and speed of an object
- **S62.42** Identify, construct, and use simple machines
- **S62.43** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S63.1** Describe characteristics of living and non-living things
- **S63.2** Classify familiar objects as living or non-living
- **S63.3** State basic needs of living things
- **S63.4** Identify the cell as the basic unit of structure of living things
- **S63.5** Describe the levels of organization in living systems for structure and function, e.g., cells, organs, organ systems
- **S63.6** Give examples of specialized cells, tissues, and organs, explaining their functions
- **S63.7** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **S63.8** Identify similarities/differences in physical characteristics of living things, using them to construct a classification system

MICROORGANISMS

PLANTS

- **S63.9** Identify the basic characteristics of plants
- **S63.10** Illustrate ways in which seeds can be dispersed
- **S63.11** Describe the plant processes: photosynthesis, transpiration, respiration

- **S63.12** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **S63.13** Identify ways in which people use plants

ANIMALS

- **S63.14** Compare similarities/differences among various groups of animals
- **S63.15** Give examples of ways in which animals have adapted to their environment
- **S63.16** Observe and describe animal behavior
- **S63.17** Report the results of an investigation concerning animal behavior in response to stimuli**,** e.g., external and internal cues
- **S63.18** Identify a variety of animals that are meat eaters/plant eaters
- **S63.19** Explain the differences between plant eaters and meat eaters
- **S63.20** Describe basic characteristics of animal groups, e.g., kingdom
- **S63.21** Explain animal structures as related to functions

ECOLOGY

- **S63.22** Define environment
- **S63.23** Explain characteristics of his/her environment
- **S63.24** Give examples of changes in environments
- **S63.25** List some effects of changes in environments
- **S63.26** List risks to the environment resulting from natural, chemical, biological, or other hazards
- **S63.27** Suggest methods for reducing risk in one of these areas
- **S63.28** Identify local plant and animal species, describing their natural histories
- **S63.29** Construct food chains/food webs illustrating energy flow in an ecosystem
- **S63.30** Define and correctly use the terms: producers, consumers, decomposers
- **S63.31** Describe ways in which populations of plants and animals in a community interact with one another and their environment
- **S63.32** Give examples of the adaptation of a species to its environment
- **S63.33** Explain how adaptation may contribute to survival, giving examples
- **S63.34** Explain the impact of one's personal life on the environment
- **S63.35** Identify and practice methods for lessening that impact
- **S63.36** Describe ways in which the supply of resources limit the growth of a population
- **S63.37** Identify organisms that require different environments, explaining how and why their environments are unique from others
- **S63.38** Discuss the positive/negative effects of environmental policies and practices in the local community
- **S63.39** Construct and maintain an aquarium/terrarium habitat

HEREDITY AND EVOLUTION

- **S63.40** Describe reproduction as essential to survival of a species
- **S63.41** Explain reproduction in plants and animals
- **S63.42** Define and use the terms correctly: genes, chromosomes
- **S63.43** Match offspring with their parents
- **S63.44** Discuss similarities/differences between individuals within their own families
- **S63.45** Identify human traits which are inherited, e.g., eye color, hair color, ear lobe attachment
- **S63.46** Describe how plants and animals have both structural and behavioral adaptations which help them survive
- **S63.47** Identify traits which result from interaction with the environment
- **S63.48** List internal/external conditions needed for survival

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S64.1** Identify major geological features of the earth's surface
- **S64.2** Identify and describe the layers of the solid earth
- **S64.3** Test minerals for color, hardness, crystalline structure, magnetism, etc.
- **S64.4** Classify rocks by their method of formation: igneous, sedimentary, metamorphic
- **S64.5** Distinguish between rocks and minerals
- **S64.6** Investigate properties of soils

EARTH CHANGES

- **S64.7** Explain how the earth has changed over time
- **S64.8** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **S64.9** Distinguish between forces that cause rapid change/slow change of the earth's surface, citing examples of each
- **S64.10** Explain and illustrate how mountains, valleys, and oceans are formed
- **S64.11** Give examples of constructive/destructive forces on the earth's surface
- **S64.12** Distinguish between past and present earth processes
- **S64.13** Explain the process of plate tectonics

ANCIENT LIFE

- **S64.14** Identify fossils as remains of prehistoric plants or animals
- **S64.15** Describe ways in which fossils can be used to acquire information
- **S64.16** Describe techniques used to acquire information
- **S64.17** Suggest reasons for the extinction of a population
- **S64.18** Discuss circumstances which may affect the rate of extinction of a population

NATURAL RESOURCES

- **S64.19** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **S64.20** Distinguish between renewable and non-renewable resources
- **S64.21** Describe ways in which people waste natural resources and opportunities to conserve them

WEATHER

- **S64.22** Observe, describe, and record daily weather conditions over a period of time
- **S64.23** Discuss and chart seasonal weather changes
- **S64.24** Interpret a weather map
- **S64.25** Apply the concept of the water cycle to daily weather conditions
- **S64.26** Identify cloud types and relate them to weather
- **S64.27** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **S64.28** Identify seasonal variations
- **S64.29** Describe climatic zones of the earth: polar, temperate, tropic

SOLAR SYSTEM

- **S64.30** Identify the sun as the source of the earth's energy (light and heat)
- **S64.31** Describe a variety of objects in the sky, e.g., sun, moon
- **S64.32** Using models, describe the movements of the earth, sun, and moon
- **S64.33** Describe the effects of these movements, e.g., phases of the moon, eclipses
- **S64.34** Explain tides as earth-moon-sun gravitational attraction
- **S64.35** Compare/contrast characteristics of the planets in our solar system
- **S64.36** Describe some scientific and technological discoveries resulting from space programs
- **S64.37** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S65.1** Identify a simple problem
- **S65.2** Suggest tools that might be used to solve the problem
- **S65.3** Propose or design a solution
- **S65.4** Implement the proposed solution
- **S65.5** Communicate the results of this process
- **S65.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **S65.7** Communicate his/her findings about the product
- **S65.8** List benefits and consequences of technological solutions
- **S65.9** Describe factors that limit technological solutions

ROLE OF SCIENCE AND TECHNOLOGY

- **S65.10** Give examples of the use of technology in scientific inquiry
- **S65.11** Describe examples of using science to explain the natural world
- **S65.12** Recognize and utilize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **S65.13** Distinguish between natural/manufactured objects
- **S65.14** Give examples of natural/manufactured objects

Content Standard F: Science in Personal and Social Perspectives

Please note that some areas of Content Standard F are covered in Standard C/Ecology.

SCIENCE AND SOCIETY

- **S66.1** Give examples of the influence of science on society
- **S66.2** Describe current research projects in a scientific field
- **S66.3** Suggest the influence the research may have on society
- **S66.4** Describe a current scientific inquiry which has created ethical conflicts
- **S66.5** Research ethical codes for research involving humans
- **S66.6** List situations in which science and technology are unable to solve human problems

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S67.1** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups
- **S67.2** Identify examples of contributions made by women, minorities, and people of other nations, e.g., Curie, Carver, Lister, Pasteur, Edison
- **S67.3** Identify major scientific milestones that have revolutionized thinking, e.g., the contributions of Mendel, Rutherford, Lavoisier, Newton, Galileo, and Darwin
- **S67.4** Describe the challenges faced by any of these individuals, and the challenges faced by scientists today
- **S67.5** Trace historical developments in science, linking them to contemporary counterparts, e.g., the work of Mendel, Rutherford, and the Wright brothers
- **S67.6** Compare/contrast how science and technology have changed over time,
- **S67.7** Understand that scientific and technological achievements build on one another, e.g., the use of telescopes from their original development to today
- **S67.8** Recognize science and technology as a source of various career opportunities, exploring talents and qualities needed, the variety of settings for employment, and various projects undertaken by scientists and engineers
- **S67.9** Give examples of projects in which scientists work in teams with other scientists or with engineers

Grade Seven

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S71.1** Observe objects or events in a variety of ways using one or more of the senses (3.1.7D, 3.2.7C)
- **S71.2** Identify properties of an object, e.g., shape, color, size, texture (3.1.7C/D, 3.2.7C)
- **S71.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers (3.2.7C)
- **S71.4** Observe objects or events by counting, comparing, estimating, and measuring (3.1.7C/D, 3.2.7C)

CLASSIFYING

- **S71.5** Identify properties useful for classifying objects (3.1.7C/D, 3.2.7C)
- **S71.6** Group objects by the properties or similarities/differences (3.1.7C/D, 3.2.7C)
- **S71.7** Construct and use classification systems (3.1.7C/D, 3.2.7C)

INFERRING

- **S71.8** Suggest explanations for events based on observations (3.2.7A/C)
- **S71.9** Distinguish between an observation and an inference (3.2.7A/C)

PREDICTING

- **S71.10** Forecast a future event based on prior experience, e.g., observation, inference, or experiment (3.2.7A/C)

MEASURING

- **S71.11** Compare and order objects by length, area, weight, volume, etc. (3.1.7C/D, 3.2.7C)
- **S71.12** Measure properties of objects or events, e.g., volume, mass, weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments (3.1.7C/D, 3.2.7C, 3.7.7B)

COMMUNICATING

- **S71.13** Construct and use written reports, drawings, diagrams, graphs, or charts to transmit information learned from science experiences (3.1.7D, 3.2.7C, 3.7.7B)
- **S71.14** Verbally ask questions about, discuss, explain, or report observations (3.2.7A/C)
- **S71.15** After an investigation, report the question tested, the experimental design used, results, and conclusions drawn, e.g., using tables or graphs (3.1.7D, 3.2.7A/C, 3.7.7B)

USING SPACE/TIME RELATIONS

- **S71.16** Describe an object's position in relation to other objects, e.g., above, below, beside (3.1.7C, 3.2.7C)
- **S71.17** Describe the motion, direction, shape, spatial arrangements, and symmetry of an object compared to another object (3.2.7C)

DEFINING OPERATIONALLY

- **S71.18** State definitions of objects or events in terms of what the object is doing or what is occurring in the event (3.1.7C, 3.2.7C)
- **S71.19** State definitions of objects or events based on observable characteristics (3.1.7C/D, 3.2.7C)

FORMULATING HYPOTHESES

- **S71.20** Identify questions or statements which can and cannot be tested (3.1.7C, 3.2.7C)
- **S71.21** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions (3.2.7A/C)

EXPERIMENTING

- **S71.22** Suggest a question for investigation (3.2.7B/C)
- **S71.23** Design an investigation to test a hypothesis (3.2.7B/C)
- **S71.24** Recognize that different types of investigations will be needed to answer different types of questions (3.2.7A/B/C)
- **S71.25** Conduct simple experiments (3.2.7B/C, 3.7.7B)
- **S71.26** Use simple equipment to gather data and extend the senses (3.2.7B/C, 3.7.7B)
- **S71.27** Use mathematics in the inquiry (3.1.7D, 3.2.7B/C, 3.7.7B)
- **S71.28** Recognize limitations of methods and tools used in experiments (experimental error) (3.2.7B/C, 3.7.7B)
- **S71.29** Use critical thinking skills to suggest alternatives to a scientific inquiry (3.2.7A/B/C)

- **S71.30** Recognize that there are a variety of ways to investigate a question; investigations may produce a variety of outcomes (3.2.7A/B/C)
- **S71.31** Utilize safe procedures while conducting investigations (3.2.7B/C, 3.7.7B)

IDENTIFYING VARIABLES

- **S71.32** Identify the independent (manipulated) variable, the dependent (responding) variable, and the variables held constant in an investigation (3.1.7C/E, 3.2.7C)
- **S71.33** Control the variables in an investigation (3.1.7E, 3.2.7C)

INTERPRETING DATA

- **S71.34** Organize and state in his/her own words information derived from a science investigation (3.1.7E, 3.2.7A/B/C)
- **S71.35** Use mathematics to interpret data (3.1.7D/E, 3.2.7A/B/C, 3.7.7B)
- **S71.36** Give examples of the use of mathematics in scientific inquiry (3.1.7D/E, 3.2.7B/C, 3.7.7B)
- **S71.37** Construct an explanation from the data and from prior knowledge, using logic and critical thinking skills (3.1.7E, 3.2.7A/B/C, 3.7.7B)
- **S71.38** Revise interpretations of data based on new information or revised data (3.1.7E, 3.2.7A/B/C, 3.7.7B)
- **S71.39** Understand that scientists question the work and data of other scientists; prior interpretations are replaced by better interpretations (3.1.7E, 3.2.7A/B/C, 3.7.7B)

FORMULATING MODELS

- **S71.40** Create a mental, physical, or verbal representation of an idea, object, or event (3.1.7D, 3.2.7C)
- **S71.41** Use models to describe and explain interrelationships of ideas, objects, or events (3.1.7D, 3.2.7C)

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S72.1** Demonstrate that all matter takes up space and has weight (3.4.7A)
- **S72.2** Differentiate among solids, liquids, and gases, giving examples of each (3.4.7A)
- **S72.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating (3.4.7A)
- **S72.4** Define density as mass per unit volume (3.4.7A)

- **S72.5** Explain that energy interacts with matter to produce change (3.4.7A)
- **S72.6** Distinguish between chemical and physical changes (3.4.7A)

MATTER: WATER

- **S72.7** Describe water as a unique substance essential to living functions and to many natural inorganic changes (3.4.7A, 3.5.7D)
- **S72.8** Predict ability of objects to float in water (3.2.7A, 3.4.7A, 3.5.7D)
- **S72.9** Use the pH scale to test for acidity or alkalinity of a water solution (3.4.7A, 3.5.7D, 3.7.7B)

MATTER: ELEMENTS

- **S72.10** Identify substances as elements, compounds, or mixtures (3.1.7C, 3.4.7A)
- **S72.11** Identify the properties of substances (3.1.7C, 3.4.7A)
- **S72.12** Group substances with common properties (3.1.7C, 3.2.7A, 3.4.7A)
- **S72.13** Separate the components of mixtures (3.4.7A)

MATTER: ATOMS AND MOLECULES

ENERGY: BASIC CHARACTERISTICS

- **S72.14** Define energy as the ability to do work (3.4.7A/B)
- **S72.15** Understand energy as a property of many substances (3.4.7A/B)
- **S72.16** Differentiate between kinetic and potential energy, giving examples of each (3.4.7A/B)
- **S72.17** Describe and practice methods of conserving energy (3.4.7A/B)

ENERGY: ELECTRICITY

- **S72.18** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber (3.4.7A/B)
- **S72.19** Explain a variety of ways in which electricity is used (3.4.7A/B)
- **S72.20** Construct electrical circuits and predict performance of variables using batteries, bulbs, wires (3.4.7A/B, 3.7.7B)
- **S72.21** Test and classify materials as conductors or non-conductors of electricity (3.1.7C, 3.4.7A/B, 3.7.7B)

ENERGY: MAGNETISM

- **S72.22** Describe and demonstrate properties of magnetism (3.4.7A/B, 3.7.7B)
- **S72.23** Sort objects according to magnetic and non-magnetic properties (3.1.7C, 3.4.7A/B)
- **S72.24** Predict attraction and repulsion between magnetic poles (3.4.7A/B)

ENERGY: LIGHT AND COLOR

- **S72.25** Demonstrate light as generated by electrical or chemical energy conversion (3.4.7A/B, 3.7.7B)
- **S72.26** Explain the mechanics of sight (3.4.7A/B)
- **S72.27** Predict, demonstrate, and describe the effects of lenses, mirrors, and prisms on the path of light (3.2.7A, 3.4.7A/B, 3.7.7B)
- **S72.28** Demonstrate and use terms correctly: straight line of travel, reflection, refraction, absorption (3.4.7A/B)
- **S72.29** Generate and identify different colors of the spectrum (3.1.7C, 3.4.7A/B, 3.7.7B)

ENERGY: SOUND

- **S72.30** Describe variations in sound, e.g., low/high, soft/loud (3.2.7A, 3.4.7A/B)
- **S72.31** Produce sound using vibration of objects (3.4.7A/B, 3.7.7B)
- **S72.32** Recognize variations in pitch and frequency (3.4.7A/B)
- **S72.33** Begin to describe the relationship between pitch and frequency (3.4.7A/B)
- **S72.34** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer (3.4.7A/B, 3.7.7B)

ENERGY: HEAT

- **S72.35** Demonstrate heat as a change agent, e.g., cooking, melting (3.4.7A/B, 3.7.7B)
- **S72.36** Suggest ways in which heat is produced (3.2.7A, 3.4.7A/B)
- **S72.37** Measure temperature in appropriate units (3.1.7D, 3.4.7A/B)
- **S72.38** Explain temperature as molecular motion (3.4.7A/B)
- **S72.39** Differentiate between heat and temperature (3.4.7A/B)
- **S72.40** Illustrate the heat transfer mechanisms: conduction, convection, radiation (3.4.7A/B, 3.7.7B)
- **S72.41** Explain the movement of heat from a warmer object to a cooler object (3.4.7A/B)
- **S72.42** Demonstrate heat generation and loss in energy exchanges (3.1.7D, 3.4.7A/B, 3.7.7B)

ENERGY: FORCE AND MACHINES

- **S72.43** Identify pushing or pulling on an object as a force (3.1.7C, 3.4.7A/B/C)
- **S72.44** Give examples of forces that move objects (3.4.7A/B/C)
- **S72.45** Identify gravity as a force (3.1.7C, 3.4.7A/B/C)
- **S72.46** Measure force with appropriate devices, e.g., balances, springs (3.1.7D, 3.4.7A/B/C, 3.7.7B)
- **S72.47** Define inertia as the resistance to change from an outside force (3.4.7A/B/C)

- **S72.48** Demonstrate the direction of motion and speed of an object (3.4.7A/B/C, 3.7.7B)
- **S72.49** Graph the motion of an object (3.1.7D, 3.4.7A/B/C)
- **S72.50** Describe the effect of multiple forces on an object (3.4.7A/B/C)
- **S72.51** Identify, construct, and use simple machines (3.1.7C, 3.4.7A/B/C, 3.7.7B)
- **S72.52** Use simple machines to predict the effects of force, changes of direction, and friction (3.4.7A/B/C, 3.7.7B)
- **S72.53** Demonstrate and describe the use of simple machines in everyday life (3.2.7A, 3.4.7A/B/C, 3.7.7B)

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S73.1** Describe characteristics of living and non-living things (3.1.7A/C, 3.3.7A)
- **S73.2** Classify familiar objects as living or non-living (3.1.7A/C, 3.3.7A)
- **S73.3** State basic needs of living things (3.1.7A, 3.3.7A)
- **S73.4** Identify the cell as the basic unit of structure of living things (3.1.7A, 3.3.7A/B)
- **S73.5** Describe the levels of organization in living systems for structure and function, e.g., cells, organs, organ systems (3.1.7A, 3.3.7A/B)
- **S73.6** Explain the life functions in cells (3.1.7A, 3.3.7A/B)
- **S73.7** Give examples of specialized cells, tissues, and organs, explaining their functions (3.1.7A, 3.3.7A/B)
- **S73.8** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human (3.1.7A, 3.3.7A/B)
- **S73.9** Identify similarities/differences in physical characteristics of living things, using them to construct a classification system (3.1.7A/C, 3.3.7A/B)

MICROORGANISMS

- **S73.10** Observe, identify, and experiment with common organisms found in pond water (3.1.7A/C, 3.2.7A, 3.3.7A, 3.7.7B)
- **S73.11** Construct a food chain, identifying the role of microorganisms, e.g., bacteria, algae, protozoans (3.1.7A/B, 3.3.7A)

PLANTS

- **S73.12** Identify the basic characteristics of plants (3.1.7A, 3.3.7A)
- **S73.13** Describe the plant processes: photosynthesis, transpiration, respiration (3.1.7A, 3.3.7A)
- **S73.14** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer (3.1.7A, 3.3.7A/D, 3.7.7B)
- **S73.15** Identify ways in which people use plants (3.1.7A, 3.2.7A, 3.3.7A)

ANIMALS

- **S73.16** Compare similarities/differences among various groups of animals (3.1.7A/C, 3.3.7A, 3.6.7A)
- **S73.17** Give examples of ways in which animals have adapted to their environment (3.1.7A/B, 3.3.7A/D, 3.6.7A)
- **S73.18** Observe and describe animal behavior (3.1.7A/B, 3.3.7A/B/D, 3.6.7A)
- **S73.19** Report the results of an investigation concerning animal behavior in response to stimuli**,** e.g., external and internal cues (3.1.7A/B, 3.3.7A/B/D, 3.6.7A, 3.7.7B)
- **S73.20** Identify a variety of animals that are meat eaters/plant eaters (3.1.7A/C, 3.3.7A)
- **S73.21** Explain the differences between plant eaters and meat eaters (3.1.7A/C, 3.3.7A)
- **S73.22** Describe basic characteristics of animal groups, e.g., kingdoms (3.1.7A/C, 3.3.7A)
- **S73.23** Explain animal structures as related to functions (3.1.7A/B, 3.3.7A/B, 3.6.7A)

ECOLOGY

- **S73.24** Define environment (3.1.7A, 3.3.7A)
- **S73.25** Explain characteristics of his/her environment (3.1.7A, 3.3.7A)
- **S73.26** Give examples of changes in environments (3.1.7A, 3.3.7A/D)
- **S73.27** List some effects of changes in environments (3.1.7A/B, 3.3.7A/D, 3.6.7A)
- **S73.28** List risks to the environment resulting from natural, chemical, biological, or other hazards (3.1.7A/B, 3.3.7A)
- **S73.29** Suggest methods for reducing risk in one of these areas (3.1.7A, 3.3.7A)
- **S73.30** Identify local plant and animal species, describing their natural histories (3.1.7A/B/C, 3.3.7A/B, 3.6.7A)
- **S73.31** Construct food chains/food webs illustrating energy flow in an ecosystem (3.1.7A/B, 3.3.7A/B, 3.6.7A)
- **S73.32** Define and correctly use the terms: producers, consumers, decomposers (3.1.7A, 3.3.7A)

- **S73.33** Describe ways in which populations of plants and animals in a community interact with one another and their environment (3.1.7A/B, 3.3.7A/B, 3.6.7A)
- **S73.34** Give examples of the adaptation of a species to its environment (3.1.7A/B, 3.3.7A/B/D, 3.6.7A)
- **S73.35** Explain how adaptation may contribute to survival, giving examples (3.1.7A/B, 3.2.7A, 3.3.7A/B/D, 3.6.7A)
- **S73.36** Explain the impact of one's personal life on the environment (3.1.7A/B, 3.2.7A, 3.3.7A/D, 3.6.7A)
- **S73.37** Identify and practice methods for lessening that impact (3.1.7A, 3.2.7A, 3.3.7A, 3.7.7B)
- **S73.38** Describe ways in which the supply of resources limit the growth of a population (3.1.7A/B, 3.3.7A/B, 3.6.7A, 3.7.7B)
- **S73.39** Identify organisms that require different environments, explaining how and why their environments are unique from others (3.1.7A/C, 3.3.7A/B, 3.6.7A)
- **S73.40** Discuss the positive/negative effects of environmental policies and practices in the local community (3.1.7A, 3.2.7A, 3.3.7A)
- **S73.41** Construct and maintain an aquarium/terrarium habitat (3.1.7A/B, 3.3.7A/B, 3.7.7B)

HEREDITY AND EVOLUTION

- **S73.42** Describe reproduction as essential to survival of a species (3.1.7A/B, 3.3.7A/B/C/D, 3.6.7A)
- **S73.43** Explain reproduction in plants and animals (3.1.7A/B, 3.3.7A/B/C/D, 3.6.7A)
- **S73.44** Define and use the terms correctly: genes, chromosomes (3.1.7A, 3.3.7A/B/C/D, 3.6.7A)
- **S73.45** Match offspring with their parents (3.1.7A/B, 3.2.7A, 3.3.7A/B/C/D, 3.6.7A)
- **S73.46** Discuss similarities/differences between individuals within their own families (3.1.7A/C, 3.2.7A, 3.3.7A/B/C/D, 3.6.7A)
- **S73.47** Identify human traits which are inherited, e.g., eye color, hair color, ear lobe attachment (3.1.7A/C, 3.3.7A/B/C/D, 3.6.7A)
- **S73.48** Distinguish between the internal/external environment of an organism (3.1.7A, 3.3.7A/B/C/D)
- **S73.49** List internal/external conditions needed for survival (3.1.7A/B, 3.3.7A/C/D)
- **S73.50** Explain evolution by applying concepts related to heredity, adaptation, and natural selection (3.1.7A/B, 3.2.7A, 3.3.7A/B/C/D, 3.6.7A)

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S74.1** Identify major geological features of the earth's surface (3.1.7C, 3.5.7A/D)
- **S74.2** Identify and describe the layers of the solid earth (3.1.7C, 3.5.7A)
- **S74.3** Test minerals for color, hardness, crystalline structure, magnetism, etc. (3.5.7A, 3.7.7B)
- **S74.4** Classify rocks by their method of formation: igneous, sedimentary, metamorphic (3.1.7C, 3.5.7A/D)
- **S74.5** Distinguish between rocks and minerals (3.5.7A)
- **S74.6** Investigate properties of soils (3.5.7A, 3.7.7B)

EARTH CHANGES

- **S74.7** Explain how the earth has changed over time (3.2.7A, 3.5.7A/D)
- **S74.8** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans (3.1.7C, 3.5.7A/D)
- **S74.9** Distinguish between forces that cause rapid change/slow change of the earth's surface, citing examples of each (3.1.7C, 3.5.7A/D)
- **S74.10** Explain and illustrate how mountains, valleys, and oceans are formed (3.5.7A/D)
- **S74.11** Give examples of constructive/destructive forces on the earth's surface (3.5.7A/D)
- **S74.12** Distinguish between past and present earth processes (3.5.7A/D)
- **S74.13** Describe the process of plate tectonics (3.5.7A)

ANCIENT LIFE

- **S74.14** Identify fossils as remains of prehistoric plants or animals (3.1.7C, 3.5.7A)
- **S74.15** Describe ways in which fossils can be used to acquire information (3.2.7A, 3.5.7A)
- **S74.16** Describe techniques used to acquire information (3.5.7A)
- **S74.17** Suggest reasons for the extinction of a population (3.2.7A, 3.5.7A)
- **S74.18** Discuss circumstances which may affect the rate of extinction of a population (3.2.7A, 3.5.7A)

NATURAL RESOURCES

- **S74.19** List natural resources, e.g., fossil fuels, water, air, metal ores, soil (3.5.7A/B/D)
- **S74.20** Distinguish between renewable and non-renewable resources (3.1.7C, 3.5.7A/B)
- **S74.21** Describe ways in which people waste natural resources and opportunities to conserve them (3.2.7A, 3.5.7A/B/D)

WEATHER

- **S74.22** Observe, describe, and record daily weather conditions over a period of time (3.2.7A, 3.5.7A/C/C/D, 3.7.7B)
- **S74.24** Interpret a weather map (3.5.7A/C)
- **S74.25** Apply the concept of the water cycle to daily weather conditions (3.5.7A/C)
- **S74.26** Identify cloud types and relate them to weather (3.1.7C, 3.5.7A/C/D)
- **S74.27** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation (3.1.7D, 3.5.7A/C/D, 3.7.7B)
- **S74.28** Describe seasonal variations, relating them to the tilt of the earth's axis (3.5.7A/C)
- **S74.29** Explain how factors such as temperature, water, topography, and wind affect climate (3.2.7A, 3.5.7A/C/D)
- **S74.30** Describe climatic zones of the earth: polar, temperate, tropic (3.5.7A/C)

SOLAR SYSTEM

- **S74.31** Identify the sun as the source of the earth's energy (light and heat) (3.1.7C, 3.4.7D, 3.5.7A)
- **S74.32** Describe a variety of objects in the sky, e.g., sun, moon (3.4.7D, 3.5.7A)
- **S74.33** Using models, describe the movements of the earth, sun, and moon (3.4.7D, 3.5.7A, 3.7.7B)
- **S74.34** Describe the effects of these movements, e.g., phases of the moon, eclipses (3.4.7D, 3.5.7A)
- **S74.35** Explain tides as earth-moon-sun gravitational attraction (3.4.7D, 3.5.7A)
- **S74.36** Compare/contrast characteristics of the planets in our solar system (3.1.7C, 3.4.7D, 3.5.7A)
- **S74.37** Describe some scientific and technological discoveries resulting from space programs (3.2.7A, 3.4.7D, 3.5.7A)
- **S74.38** Identify major structures found in the universe, e.g., stars, constellations, galaxies (3.4.7D, 3.5.7A)

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S75.1** Identify a simple problem (3.2.7D, 3.6.7C, 3.7.7A/C/D/E, 3.8.7C)
- **S75.2** Suggest tools that might be used to solve the problem (3.2.7A/D, 3.6.7C, 3.7.7A/C/D/E, 3.8.7C)
- **S75.3** Propose or design a solution (3.2.7A/D, 3.6.7C, 3.7.7A/C/D/E, 3.8.7C)
- **S75.4** Implement the proposed solution (3.2.7D, 3.6.7C, 3.7.7A/B/C/D/E, 3.8.7C)
- **S75.5** Communicate the results of this process (3.2.7D, 3.6.7B/C, 3.7.7A/C/D/E, 3.8.7C)
- **S75.6** Demonstrate the ability to manipulate a technological product, e.g., software (3.2.7D, 3.6.7C, 3.7.7A/B/C/D/E, 3.8.7C)
- **S75.7** Communicate his/her findings about the product (3.2.7D, 3.6.7B/C, 3.7.7A/C/D/E, 3.8.7C)
- **S75.8** List benefits and consequences of technological solutions (3.2.7A/D, 3.6.7B/C, 3.7.7A/C/D/E, 3.8.7C)
- **S75.9** Describe factors that limit technological solutions (3.2.7A/D, 3.6.7B/C, 3.7.7A/CD/E, 3.8.7C)

ROLE OF SCIENCE AND TECHNOLOGY

- **S75.10** Give examples of the use of technology in scientific inquiry (3.2.7D, 3.6.7A/C, 3.7.7C/D/E, 3.8.7C)
- **S75.11** Describe examples of using science to explain the natural world (3.2.7D, 3.6.7A/B/C, 3.7.7C/D/E, 3.8.7C)
- **S75.12** Recognize and utilize a variety of tools/equipment used by scientists (3.2.7D, 3.6.7A/C, 3.7.7B/C/D/E, 3.8.7C)

DISTINGUISHING OBJECTS

- **S75.13** Give examples of natural/manufactured objects (3.1.7C, 3.2.7A, 3.6.7C, 3.7.7C)
- **S75.14** Distinguish between natural/manufactured objects (3.1.7C, 3.2.7A, 3.6.7C, 3.7.7C)

Content Standard F: Science in Personal and Social Perspectives

Please note that some areas of Content Standard F are covered in Standard C/Ecology.

SCIENCE AND SOCIETY

- **S76.1** Give examples of the influence of science on society (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B/C)
- **S76.2** Describe current research projects in a scientific field (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B/C)
- **S76.3** Suggest the influence the research may have on society (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B/C)
- **S76.4** Describe a current scientific inquiry which has created ethical conflicts (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B/C)
- **S76.5** Research ethical codes for research involving humans (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B/C)
- **S76.6** List situations in which science and technology are unable to solve human problems (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B/C)

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S77.1** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.2** Identify examples of contributions made by women, minorities, and people of other nations, e.g., Curie, Carver, Lister, Pasteur, Edison (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.3** Identify major scientific milestones that have revolutionized thinking, e.g., the contributions of Mendel, Rutherford, Lavoisier, Newton, Galileo, and Darwin (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.4** Describe the challenges faced by any of these individuals, and the challenges faced by scientists today (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.5** Trace historical developments in science, linking them to contemporary counterparts, e.g., the work of Mendel, Rutherford, and the Wright brothers (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)

- **S77.6** Compare/contrast how science and technology have changed over time (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.7** Understand that scientific and technological achievements build on one another, e.g., the use of telescopes from their original development to today (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.8** Recognize science and technology as a source of various career opportunities, exploring talents and qualities needed, the variety of settings for employment, and various projects undertaken by scientists and engineers (3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)
- **S77.9** Give examples of projects in which scientists work in teams with other scientists or with engineers (3.2.7A, 3.6.7A/B/C, 3.7.7A/B, 3.8.7A/B)

Grade Eight

Content Standard A: Science as Inquiry

The student will:

OBSERVING

- **S81.1** Observe objects or events in a variety of ways using one or more of the senses
- **S81.2** Identify properties of an object, e.g., shape, color, size, texture
- **S81.3** Use indirect methods to observe objects or events, e.g., hand lenses, thermometers
- **S81.4** Observe objects or events by counting, comparing, estimating, and measuring

CLASSIFYING

- **S81.5** Identify properties useful for classifying objects
- **S81.6** Group objects by the properties or similarities/differences
- **S81.7** Construct and use classification systems

INFERRING

- **S81.8** Suggest explanations for events based on observations
- **S81.9** Distinguish between an observation and an inference

PREDICTING

- **S81.10** Forecast a future event based on prior experience, e.g., observation, inference, or experiment

MEASURING

- **S81.11** Compare and order objects by length, area, weight, volume, etc.
- **S81.12** Measure properties of objects or events, e.g., volume, mass, weight, temperature, area, length, and time, by using standardized units of measure and appropriate measuring instruments

COMMUNICATING

- **S81.13** Construct and use written reports, drawings, diagrams, graphs, or charts to transmit information learned from science experiences
- **S81.14** Verbally ask questions about, discuss, explain, or report observations
- **S81.15** After an investigation, report the question tested, the experimental design used, results, and conclusions drawn, e.g., using tables or graphs

USING SPACE/TIME RELATIONS

- **S81.16** Describe an object's position in relation to other objects, e.g., above, below, behind
- **S81.17** Describe the motion, direction, shape, spatial arrangements, and symmetry of an object compared to another object

DEFINING OPERATIONALLY

- **S81.18** State definitions of objects or events in terms of what the object is doing or what is occurring in the event
- **S81.19** State definitions of objects or events based on observable characteristics

FORMULATING HYPOTHESES

- **S81.20** Identify questions or statements which can and cannot be tested
- **S81.21** Design statements which can be tested by an experiment, e.g., questions, inferences, predictions

EXPERIMENTING

- **S81.22** Suggest a question for investigation
- **S81.23** Design an investigation to test a hypothesis
- **S81.24** Recognize that different types of investigations will be needed to answer different types of questions
- **S81.25** Conduct simple experiments
- **S81.26** Use simple equipment to gather data and extend the senses
- **S81.27** Use mathematics in the inquiry
- **S81.28** Recognize limitations of methods and tools used in experiments (experimental error)
- **S81.29** Use critical thinking skills to suggest alternatives to a scientific inquiry
- **S81.30** Recognize that there are a variety of ways to investigate a question; investigations may produce a variety of outcomes
- **S81.31** Utilize safe procedures while conducting investigations

RECOGNIZING VARIABLES

- **S81.32** Identify the independent (manipulated) variable, the dependent (responding) variable, and the variables held constant in an investigation
- **S81.33** Control the variables in an investigation

INTERPRETING DATA

- **S81.34** Organize and state in his/her own words information derived from a science investigation
- **S81.35** Use mathematics to interpret data
- **S81.36** Give examples of the use of mathematics in scientific inquiry
- **S81.37** Construct an explanation from the data and from prior knowledge, using logic and critical thinking skills

- **S81.38** Revise interpretations of data based on new information or revised data
- **S81.39** Understand that scientists question the work and data of other scientists; prior interpretations are replaced by better interpretations

FORMULATING MODELS

- **S81.40** Create a mental, physical, or verbal representation of an idea, object, or event
- **S81.41** Use models to describe and explain interrelationships of ideas, objects, or events

Content Standard B: Physical Science

The students will:

MATTER: FORM/STATE

- **S82.1** Demonstrate that all matter takes up space and has weight
- **S82.2** Differentiate among solids, liquids, and gases, giving examples of each
- **S82.3** Describe changes of state (solid, liquid, gas), e.g., ice cube melting and evaporating
- **S82.4** Define density as mass per unit volume
- **S82.5** Explain that energy interacts with matter to produce change
- **S82.6** Distinguish between chemical and physical changes

MATTER: WATER

- **S82.7** Describe water as a unique substance essential to living functions and to many natural inorganic changes
- **S82.8** Predict ability of objects to float in water
- **S82.9** Use the pH scale to test for acidity or alkalinity of a water solution

MATTER: ELEMENTS

- **S82.10** Identify substances as elements, compounds, or mixtures
- **S82.11** Describe properties of common elements
- **S82.12** Differentiate between metals and non-metals
- **S82.13** Identify the properties of substances
- **S82.14** Group substances with common properties
- **S82.15** Separate the components of mixtures

MATTER: ATOMS AND MOLECULES

- **S82.16** Draw a diagram/make a model of an atom
- **S82.17** Describe the properties of an atom's components
- **S82.18** Distinguish between an atom and a molecule

ENERGY: BASIC CHARACTERISTICS

- **S82.19** Define energy as the ability to do work
- **S82.20** Measure energy in appropriate units
- **S82.21** Understand energy as a property of many substances
- **S82.22** Differentiate between kinetic and potential energy, giving examples of each
- **S82.23** Identify forms of energy involved in energy transformations, e.g., chemical, light, heat
- **S82.24** Discuss the emission of energy in chemical and nuclear reactions
- **S82.25** Describe and practice methods of conserving energy

ENERGY: ELECTRICITY

- **S82.26** Perform simple demonstrations of static electricity using commonly available materials, e.g., plastic, glass, paper, rubber
- **S82.27** Explain a variety of ways in which electricity is used
- **S82.28** Construct electrical circuits and predict performance of variables using batteries, bulbs, wires
- **S82.29** Test and classify materials as conductors or non-conductors of electricity

ENERGY: MAGNETISM

- **S82.30** Describe and demonstrate properties of magnetism
- **S82.31** Sort objects according to magnetic and non-magnetic properties
- **S82.32** Predict attraction and repulsion between magnetic poles

ENERGY: LIGHT AND COLOR

- **S82.33** Demonstrate light as generated by electrical or chemical energy conversion
- **S82.34** Explain the mechanics of sight
- **S82.35** Predict, demonstrate, and describe the effects of lenses, mirrors, and prisms on the path of light
- **S82.36** Demonstrate and use terms correctly: straight line of travel, reflection, refraction, absorption
- **S82.37** Generate and identify different colors of the spectrum

ENERGY: SOUND

- **S82.38** Describe variations in sound, e.g., low/high, soft/loud)
- **S82.39** Produce sound using vibration of objects
- **S82.40** Recognize variations in pitch and frequency
- **S82.41** Begin to describe the relationship between pitch and frequency
- **S82.42** Construct sound transmitting devices, e.g., rubber band instruments, electrical buzzer

ENERGY: HEAT

- **S82.43** Demonstrate heat as a change agent, e.g., cooking, melting
- **S82.44** Suggest ways in which heat is produced
- **S82.45** Measure temperature in appropriate units
- **S82.46** Explain temperature as molecular motion
- **S82.47** Differentiate between heat and temperature
- **S82.48** Illustrate the heat transfer mechanisms: conduction, convection, radiation
- **S82.49** Explain the movement of heat from a warmer object to a cooler object
- **S82.50** Demonstrate heat generation and loss in energy exchanges

ENERGY: FORCE AND MACHINES

- **S82.51** Identify pushing or pulling on an object as a force
- **S82.52** Give examples of forces that move objects
- **S82.53** Identify gravity as a force
- **S82.54** Measure force with appropriate devices, e.g., balances, springs
- **S82.55** Define inertia as the resistance to change from an outside force
- **S82.56** Demonstrate the direction of motion and speed of an object
- **S82.57** Graph the motion of an object
- **S82.58** Describe the effect of multiple forces on an object
- **S82.59** Identify, construct, and use simple machines
- **S82.60** Use simple machines to predict the effects of force, changes of direction, and friction
- **S82.61** Demonstrate and describe the use of simple machines in everyday life

Content Standard C: Life Science

Please note that certain areas of Standard C are covered in the Health Curriculum Guidelines.

The students will:

CHARACTERISTICS OF LIVING THINGS

- **S83.1** Describe characteristics of living and non-living things
- **S83.2** Classify familiar objects as living or non-living
- **S83.3** Identify basic needs of living things
- **S83.4** Identify the cell as the basic unit of structure of living things
- **S83.5** Describe the levels of organization in living systems for structure and function, e.g., cells, organs, organ systems
- **S83.6** Explain the life functions in cells

- **S83.7** Give examples of specialized cells, tissues, and organs, explaining their functions
- **S83.8** Illustrate the life cycle of a living thing, e.g., bean plant, insect, human
- **S83.9** Identify similarities/differences in physical characteristics of living things, using them to construct a classification system

MICROORGANISMS

- **S83.10** Observe, identify, and experiment with common organisms found in pond water
- **S83.11** Construct a food chain, identifying the role of microorganisms, e.g., bacteria, algae, protozoans

PLANTS

- **S83.12** Identify the basic characteristics of plants
- **S83.13** Illustrate ways in which seeds can be dispersed
- **S83.14** Describe the plant processes: photosynthesis, transpiration, and respiration
- **S83.15** Design and conduct an investigation to determine the effect of a selected variable on plant growth, e.g., light, water, fertilizer
- **S83.16** Identify ways in which people use plants

ANIMALS

- **S83.17** Compare similarities/differences among various groups of animals
- **S83.18** Give examples of ways in which animals have adapted to their environment
- **S83.19** Observe and describe animal behavior
- **S83.20** Report the results of an investigation concerning animal behavior in response to stimuli**,** e.g., external and internal cues
- **S83.21** Explain the differences between plant eaters and meat eaters
- **S83.22** Describe basic characteristics of animal groups, e.g., kingdoms
- **S83.23** Explain animal structures as related to function

ECOLOGY

- **S83.24** Define environment
- **S83.25** Explain characteristics of his/her environment
- **S83.26** Give examples of changes in environments
- **S83.27** List some effects of changes in environments
- **S83.28** List risks to the environment resulting from natural, chemical, biological, or other hazards
- **S83.29** Suggest methods for reducing risk in one of these areas
- **S83.30** Identify local plant and animal species, describing their natural histories
- **S83.31** Construct food chains/food webs illustrating energy flow in an ecosystem

- **S83.32** Define and correctly use the terms: producers, consumers, decomposers
- **S83.33** Describe ways in which populations of plants and animals in a community interact with one another and their environment
- **S83.34** Give examples of the adaptation of a species to its environment
- **S83.35** Explain how adaptation may contribute to survival, giving examples
- **S83.36** Explain the impact of one's personal life on the environment
- **S83.37** Identify and practice methods for lessening that impact
- **S83.38** Describe ways in which the supply of resources limit the growth of a population
- **S83.39** Identify organisms that require different environments, explaining how and why their environments are unique from others
- **S83.40** Discuss the positive/negative effects of environmental policies and practices in the local community
- **S83.41** Construct and maintain an aquarium/terrarium habitat

HEREDITY AND EVOLUTION

- **S83.42** Describe reproduction as essential to survival of a species
- **S83.43** Explain reproduction in plants and animals
- **S83.44** Define and use the terms correctly: genes, chromosomes
- **S83.45** Match offspring with their parents
- **S83.46** Discuss similarities/differences between individuals within their own families
- **S83.47** Identify human traits which are inherited, e.g., eye color, hair color, ear lobe attachment
- **S83.48** Distinguish between the internal/external environment of an organism
- **S83.49** List internal/external conditions needed for survival
- **S83.50** Explain evolution by applying concepts related to heredity, adaptation, and natural selection

Content Standard D: Earth and Space Science

The students will:

GEOLOGY

- **S84.1** Identify major geological features of the earth's surface
- **S84.2** Identify and describe the layers of the solid earth
- **S84.3** Test rocks for color, hardness, crystalline structure, magnetism, etc.
- **S84.4** Classify minerals by their method of formation: igneous, sedimentary, metamorphic
- **S84.5** Distinguish between rocks and minerals
- **S84.6** Investigate properties of soils

EARTH CHANGES

- **S84.7** State in his/her own words how the earth has changed over time
- **S84.8** Identify forces tending to change the earth's surface, e.g., water, air flow, vulcanism, humans
- **S84.9** Distinguish between forces that cause rapid change/slow change of the earth's surface, citing examples of each
- **S84.10** Explain and illustrate how maintains, valleys, and oceans are formed
- **S84.11** Give examples of constructive/destructive forces on the earth's surface
- **S84.12** Distinguish between past and present earth processes
- **S84.13** Describe the process of plate tectonics

ANCIENT LIFE

- **S84.14** Compare ancient life with life today
- **S84.15** Identify fossils as remains of prehistoric plants or animals
- **S84.16** Describe ways in which fossils can be used to acquire information
- **S84.17** Describe techniques used to acquire information
- **S84.18** Suggest reasons for the extinction of a population
- **S84.19** Discuss circumstances which may affect the rate of extinction of a population

NATURAL RESOURCES

- **S84.20** List natural resources, e.g., fossil fuels, water, air, metal ores, soil
- **S84.21** Distinguish between renewable and non-renewable resources
- **S84.22** Describe ways in which people waste natural resources an opportunities to conserve them

WEATHER

- **S84.23** Observe, describe, and record daily weather conditions over a period of time
- **S84.24** Discuss and chart seasonal weather changes
- **S84.25** Interpret a weather map
- **S84.26** Apply the concept of the water cycle to daily weather conditions
- **S84.27** Identify cloud types and relate them to weather
- **S84.28** Construct simple weather instruments and use them to measure weather phenomena, e.g., air pressure, wind direction, precipitation
- **S84.29** Describe seasonal variations, relating them to the tilt of the earth's axis
- **S84.30** Explain how factors such as temperature, water, topography, and wind affect climate
- **S84.31** Describe climatic zones of the earth: polar, temperate, tropic

SOLAR SYSTEM

- **S84.32** Identify the sun as the source of the earth's energy (light and heat)
- **S84.33** Describe a variety of objects in the sky, e.g., sun, moon, clouds
- **S84.34** Using models, describe the movements of the earth, sun, and moon
- **S84.35** Describe the effects of these movements, e.g., phases of the moon, eclipses
- **S84.36** Explain tides as earth-moon-sun gravitational attraction
- **S84.37** Compare/contrast characteristics of the planets in our solar system
- **S84.38** Describe some scientific and technological discoveries resulting from space programs
- **S84.39** Identify major structures found in the universe, e.g., stars, constellations, galaxies

Content Standard E: Science and Technology

Please note that many areas of Content Standard E are covered in the Technology Curriculum Guidelines.

TECHNOLOGICAL DESIGN

- **S85.1** Identify a simple problem
- **S85.2** Suggest tools that might be used to solve the problem
- **S85.3** Propose or design a solution
- **S85.4** Implement the proposed solution
- **S85.5** Communicate the results of this process
- **S85.6** Demonstrate the ability to manipulate a technological product, e.g., software
- **S85.7** Communicate his/her findings about the product
- **S85.8** List benefits and consequences of technological solutions
- **S85.9** Describe factors that limit technological solutions

ROLE OF SCIENCE AND TECHNOLOGY

- **S85.10** Give examples of the use of technology in scientific inquiry
- **S85.11** Describe examples of using science to explain the natural world
- **S85.12** Recognize and utilize a variety of tools/equipment used by scientists

DISTINGUISHING OBJECTS

- **S85.13** Give examples of natural/designed objects
- **S85.14** Distinguish between natural/designed objects

Content Standard F: Science in Personal and Social Perspectives

Please note that some areas of Content Standard F are covered in Standard C/Ecology.

SCIENCE AND SOCIETY

- **S86.1** Give examples of the influence of science on society
- **S86.2** Describe current research projects in a scientific field
- **S86.3** Suggest the influence the research may have on society
- **S86.4** Describe a current scientific inquiry which has created ethical conflicts
- **S86.5** Research ethical codes for research involving humans
- **S86.6** List situations in which science and technology are unable to solve human problems

Content Standard G: History and Nature of Science

The students will:

SCIENCE AS A HUMAN ENDEAVOR

- **S87.1** Recognize that scientific contributions have been made by people of all nations, genders, racial, and ethnic groups
- **S87.2** Identify examples of contributions made by women, minorities, and people of other nations, e.g., Curie, Carver, Lister, Pasteur, Edison
- **S87.3** Identify major scientific milestones that have revolutionized thinking, e.g., the contributions of Mendel, Rutherford, Lavoisier, Newton, Galileo, and Darwin
- **S87.4** Describe the challenges faced by any of these individuals, and the challenges faced by scientists today
- **S87.5** Trace historical developments in science, linking them to contemporary counterparts, e.g., the work of Mendel, Rutherford, and the Wright brothers
- **S87.6** Compare/contrast how science and technology have changed over time,
- **S87.7** Understand that scientific and technological achievements build on one another, e.g., the use of telescopes from their original development to today
- **S87.8** Recognize science and technology as a source of various career opportunities, exploring talents and qualities needed, the variety of settings for employment, and various projects undertaken by scientists and engineers
- **S87.9** Give examples of projects in which scientists work in teams with other scientists or with engineers

Appendix: The Science Content Standards

From National Science Education Standards
The National Research Council
National Academy Press, Washington, D.C.
1996

The eight categories of content standards are

* Unifying concepts and processes in science.
* Science as inquiry.
* Physical science.
* Life science.
* Earth and space science.
* Science and technology.
* Science in personal and social perspectives.
* History and nature of science.

The standard for unifying concepts and processes is presented for grades K-12, because the understanding and abilities associated with major conceptual and procedural schemes need to be developed over an entire education, and the unifying concepts and processes transcend disciplinary boundaries. The next seven categories are clustered for grades K-4, 5-8, and 9-12. Those clusters were selected based on a combination of factors, including cognitive development theory, the classroom experience of teachers, organization of schools, and the frameworks of other disciplinary-based standards.

The sequence of the seven grade-level content standards is not arbitrary: Each standard subsumes the knowledge and skills of other standards. Students' understandings and abilities are grounded in the experience of inquiry, and inquiry is the foundation for the development of understandings and abilities of the other content standards. The personal and social aspects of science are emphasized increasingly in the progression from science as inquiry standards to the history and nature of science standards. Students need solid knowledge and understanding in physical, life, and earth and space science if they are to apply science.

Multidisciplinary perspectives also increase from the subject-matter standards to the standard on the history and nature of science, providing many opportunities for integrated approaches to science teaching.

UNIFYING CONCEPTS AND PROCESSES STANDARD

Conceptual and procedural schemes unify science disciplines and provide students with powerful ideas to help them understand the natural world. Because of the underlying principles embodied in this standard, the understandings and abilities described here are repeated in the other content standards. Unifying concepts and processes include

* Systems, order, and organization.
* Evidence, models, and explanation.
* Change, constancy, and measurement.
* Evolution and equilibrium.
* Form and function.

This standard describes some of the integrative schemes that can bring together students' many experiences in science education across grades K-12. The unifying concepts and processes standard can be the focus of instruction at any grade level but should always be closely linked to outcomes aligned with other content standards. In the early grades, instruction should establish the meaning and use of unifying concepts and processes--for example, what it means to measure and how to use measurement tools. At the upper grades, the standard should facilitate and enhance the learning of scientific concepts and principles by providing students with a big picture of scientific ideas--for example, how measurement is important in all scientific endeavors.

SCIENCE AS INQUIRY STANDARDS

In the vision presented by the *Standards*, inquiry is a step beyond "science as a process," in which students learn skills, such as observation, inference, and experimentation. The new vision includes the "processes of science" and requires that students combine processes and scientific knowledge as they use scientific reasoning and critical thinking to develop their understanding of science. Engaging students in inquiry helps students develop:

* Understanding of scientific concepts.
* An appreciation of "how we know" what we know in science.
* Understanding of the nature of science.
* Skills necessary to become independent inquirers about the natural world.
* The dispositions to use the skills, abilities, and attitudes associated with science.

Science as inquiry is basic to science education and a controlling principle in the ultimate organization and selection of students' activities. The standards on inquiry highlight the ability to conduct inquiry and develop understanding about scientific inquiry. Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting

investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments. The science as inquiry standards are described in terms of activities resulting in student development of certain abilities and in terms of student understanding of inquiry.

PHYSICAL SCIENCE, LIFE SCIENCE, AND EARTH AND SPACE SCIENCE STANDARDS

The standards for physical science, life science, and earth and space science describe the subject matter of science using three widely accepted divisions of the domain of science. Science subject matter focuses on the science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.

SCIENCE AND TECHNOLOGY STANDARDS

The science and technology standards establish connections between the natural and designed worlds and provide students with opportunities to develop decision-making abilities. They are not standards for technology education; rather, these standards emphasize abilities associated with the process of design and fundamental understandings about the enterprise of science and its various linkages with technology.

As a complement to the abilities developed in the science as inquiry standards, these standards call for students to develop abilities to identify and state a problem, design a solution--including a cost and risk-and-benefit analysis--implement a solution, and evaluate the solution.

Science as inquiry is parallel to technology as design. Both standards emphasize student development of abilities and understanding.

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES STANDARDS

An important purpose of science education is to give students a means to understand and act on personal and social issues. The science in personal and social perspectives standards help students develop decision-making skills. Understandings associated with the concepts give students a foundation on which to base decisions they will face as citizens.

HISTORY AND NATURE OF SCIENCE STANDARDS

In learning science, students need to understand that science reflects its history and is an ongoing, changing enterprise. The standards for the history and nature of science recommend the use of history in school science programs to clarify different aspects of

scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures.

Form of the Content Standards

Each content standard states that, as the result of activities provided for all students in the grade level discussed, the content of the standard is to be understood or the abilities are to be developed.

Fundamental ideas underlie each standard. Content is fundamental if it:

* Represents a central event or phenomenon in the natural world.
* Represents a central scientific idea and organizing principle.
* Has rich explanatory power.
* Guides fruitful investigations.
* Applies to situations and contexts common to everyday experiences.
* Can be linked to meaningful learning experiences.
* Is developmentally appropriate for students at the grade level specified.

Criteria for the Content Standards

Three criteria influence the selection of science content. The first is an obligation to the domain of science. The subject matter in the physical, life, and earth and space science standards is central to science education and must be accurate. The presentation in national standards also must accommodate the needs of many individuals who will implement the standards in school science programs. The standards represent science content accurately and appropriately at all grades, with increasing precision and more scientific nomenclature from kindergarten to grade 12.

The second criterion is an obligation to develop content standards that appropriately represent the developmental and learning abilities of students. Organizing principles were selected that express meaningful links to direct student observations of the natural world. The content is aligned with students' ages and stages of development. This criterion includes increasing emphasis on abstract and conceptual understandings as students progress from kindergarten to grade 12.

The third criterion is an obligation to present standards in a usable form for those who must implement the standards, e.g., curriculum developers, science supervisors, teachers, and other school personnel. The standards need to provide enough breadth of content to define the domains of science, and they need to provide enough depth of content to direct the design of science curricula. The descriptions also need to be understandable by school personnel and to accommodate the structures of elementary,

middle, and high schools, as well as the grade levels used in national standards for other disciplines.

Use of the Content Standards

Many different individuals and groups will use the content standards for a variety of purposes. *All users and reviewers are reminded that the content described is not a science curriculum*. Content is what students should learn. Curriculum is the way content is organized and emphasized; it includes structure, organization, balance, and presentation of the content in the classroom. Although the structure for the content standards organizes the understanding and abilities to be acquired by all students K-12, that structure does not imply any particular organization for science curricula.

Persons responsible for science curricula, teaching, assessment and policy who use the *Standards* should note the following:

* None of the eight categories of content standards should be eliminated. For instance, students should have opportunities to learn science in personal and social perspectives and to learn about the history and nature of science, as well as to learn subject matter, in the school science program.
* No standards should be eliminated from a category. For instance, "biological evolution" cannot be eliminated from the life science standards.
* Science content can be added. The connections, depth, detail, and selection of topics can be enriched and varied as appropriate for individual students and school science programs. However, addition of content must not prevent the learning of fundamental concepts by all students.
* The content standards must be used in the context of the standards on teaching and assessment. Using the standards with traditional teaching and assessment strategies defeats the intentions of the *National Science Education Standards*.

As science advances, the content standards might change, but the conceptual organization will continue to provide students with knowledge, understanding, and abilities that will improve their scientific literacy.