

**USD #447 Cherryvale-Thayer Schools**  
**Science**

**KINDERGARTEN**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Scientific inquiries**

- 1.1.1 The student identifies properties of objects.
- 1.1.5 describes an observation orally or pictorially.

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Describe objects**

- 2.1.2 separates or sorts a group of objects or materials by properties

**Standard 3. LIFE SCIENCE**

**Benchmark - Characteristics of living things**

- 3.1.4 examines the structures/parts of living things.

**Standard 4. EARTH AND SPACE SCIENCE**

**Benchmark - Objects in the sky**

- 4.2.1 observes and recognizes the sun, moon, stars, clouds, birds, airplanes, and other objects in the sky.
- 4.2.2 describes that the sun provides light and warmth

**Benchmark - Changes in weather**

- 4.3.1 observes changes in the weather from day to day.
- 4.3.3 discusses weather safety procedures

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Learn about the world around them.**

- 5.1.1 explores the way things work

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Responsibility for their own health.**

- 6.1.2 discusses healthy foods
- 6.1.3 discusses that humans need to practice being safe.
- 6.1.1 engages in personal care

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**Science**

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Practices science**

**7.1.2** uses technology to learn about people in science.

**7.1.1** is involved in explorations that make his/her mind wonder and know that he/she is practicing science.

**First Grade**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Scientific inquiries**

- 1.1.2 classifies and arranges groups of objects by a variety of properties, one property at a time
- 1.1.5 describes an observation orally or pictorially.

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Describe objects**

- 2.1.3 compares the properties of solids and liquids.
- 2.1.4 describes the position of an object in relation to other objects.

**Standard 3. LIFE SCIENCE**

- 3.1.1 discusses that organisms live only in environments in which their needs can be met.
- 3.1.3 observes living things in various environments.
- 3.1.4 examines the structures/parts of living things.

**Standard 4. EARTH AND SPACE SCIENCE**

**Benchmark - Properties of earth materials**

- 4.1.1 observes, compares, and sorts earth materials.

**Benchmark - Changes in weather**

- 4.3.3 discusses weather safety procedures

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Learn about the world around them.**

- 5.1.1 explores the way things work

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Responsibility for their own health.**

- 6.1.2 discusses healthy foods
- 6.1.3 discusses that humans need to practice being safe.
- 6.1.1 engages in personal care

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Science

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**7.1.2** uses technology to learn about people in science.

**7.1.1** is involved in explorations that make his/her mind wonder and know that he/she is practicing science.

**Second Grade**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Scientific inquiries**

- 1.1.3 uses appropriate materials, tools, and safety procedures to collect information.
- 1.1.4 asks and answers questions about objects, organisms, and events in his/her environment.
- 1.1.5 describes an observation orally or pictorially.

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Describe objects**

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

**Standard 3. LIFE SCIENCE**

**Benchmark - Characteristics of living things**

- 3.1.2 observes life cycles of different living things.
- 3.1.4 examines the structures/parts of living things.

**Standard 4. EARTH AND SPACE SCIENCE**

**Benchmark - Changes in weather**

- 4.3.2 records weather changes daily
- 4.3.3 discusses weather safety procedures

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Learn about the world around them.**

- 5.1.2 experiences science through technology

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Responsibility for their own health**

- 6.1.3 discusses that humans need to practice being safe.
- 6.1.2 discusses healthy foods
- 6.1.1 engages in personal care

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Practices science**

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**7.1.2** uses technology to learn about people in science.

**7.1.1** is involved in explorations that make his/her mind wonder and know that he/she is practicing science.

**Third Grade**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Full inquiry**

- begins developing the ability to communicate, critique, analyze his/her own investigations, and interpret the work of other
- 1.1.4** students.
- 1.1.2** plans and conducts a simple investigation.
- 1.1.3** employs appropriate equipment, tools, and safety procedures to gather data.
- 1.1.1** asks questions that he/she can answer by investigating

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Describe objects**

- 2.1.2** describes and classifies objects by more than one property.
- 2.1.3** observes and records how one object interacts with another object.
- 2.1.4** recognizes and describes the differences between solids, liquids, and gases.
- 2.1.1** Observes properties of objects and measures those properties using appropriate tools.

**Benchmark - Movement of objects**

- 2.2.1** moves objects by pushing, pulling, throwing, spinning, dropping, and rolling and describes the motion.
- 2.2.2** describes the change in position of objects when moved.

**Benchmark - Electricity and magnetism.**

- 2.4.1** demonstrates that magnets attract and repel
- 2.4.3** constructs a simple circuit.

**Standard 3. LIFE SCIENCE**

**Benchmark - Organisms in their environment**

- 3.1.3** discusses ways organisms use their senses to survive in their environments.
- 3.1.2** compares basic needs of different organisms in their environment.  
observes different organisms and compares and contrasts how similar functions are served by different structural
- 3.1.1** characteristics.

**Standard 4. EARTH AND SPACE SCIENCE**

**Benchmark - Properties of earth materials**

- 4.1.1** collects, observes properties, and classifies a variety of earth materials in his/her environment.

**4.1.2** experiments with a variety of soils (clay, silt, sand, and loam).

**4.1.3** Describes properties of water and process of the water cycle.

**Benchmark - Objects in the sky.**

**4.2.2** observes and compares the length of shadows.

**4.2.1** observes the moon and stars

**4.2.3** discusses that the sun provides light and heat (electro-magnetic radiation) to maintain the temperature of the earth

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Technology design**

identifies a simple design problem (designs a plan, implements the plan, evaluates the results, makes changes to improve

**5.1.1** the product, and communicates the results).

**Benchmark - Understanding science and technology**

**5.2.1** will understand that the design process produces knowledge that can be used to solve a problem and improve our world.

**5.2.2** invents a product to solve problems

**5.2.3** works with others to solve problems.

**5.2.5** investigates how scientists use tools to observe.

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Personal health.**

**6.1.1** discusses the nutritional value of various foods and their contribution to health.

**6.1.2** discusses that safety involves preventing injury by avoiding inappropriate risks and dangers.

**6.1.3** assumes some responsibility for his/her own health and the health and well being of others.

**Benchmark - Changes in the environment.**

**6.2.1** defines pollution

**6.2.3** practices reducing, reusing, and recycling.

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Awareness that people practice science**

**7.1.1** recognizes that students participate in science inquiry by asking questions.

**Fourth Grade**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Full inquiry**

- begins developing the ability to communicate, critique, analyze his/her own investigations, and interpret the work of other
- 1.1.4** students.
- 1.1.3** employs appropriate equipment, tools, and safety procedures to gather data.
- 1.1.2** plans and conducts a simple investigation.
- 1.1.1** asks questions that he/she can answer by investigating

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Describe objects**

- 2.1.1** observes properties of objects and measures those properties using appropriate tools.
- 2.1.3** observes and records how one object interacts with another object.

**Benchmark - What makes sounds**

- 2.3.1** identifies that the source of sound is vibrations.
- 2.3.2** discriminates between sounds made by different objects.
- 2.3.3** discriminates between various pitches.

**Benchmark - Electricity and magnetism.**

- 2.4.2** designs a simple experiment to determine whether various objects will be attracted to magnets.
- 2.4.3** constructs a simple circuit.

**Standard 3. LIFE SCIENCE**

**Benchmark - Lifestyles of Various Organisms**

- 3.2.1** compares, contrasts, and asks questions about life cycles of various organisms.

**Standard 4. EARTH AND SPACE SCIENCE**

**Benchmark - Properties of earth materials**

- 4.1.3** describes properties of water and process of the water.
- 4.1.4** observes and records the properties of fossils and discusses what fossils are.

**Benchmark - Changes in the earth and weather.**

- 4.3.1** describes changes in the surface of the earth.

**4.3.2** observes, describes, and records daily and seasonal weather changes.

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Technology design**

identifies a simple design problem (designs a plan, implements the plan, evaluates the results, makes changes to improve

**5.1.1** the product, and communicates the results).

**Benchmark - Understanding science and technology**

**5.2.1** will understand that the design process produces knowledge that can be used to solve a problem and improve our world.

develops an awareness that women and men of all ages, backgrounds, and ethnic groups engage in a variety of scientific

**5.2.4** and technological work.

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Personal health.**

**6.1.1** discusses the nutritional value of various foods and their contribution to health.

**6.1.2** discusses that safety involves preventing injury by avoiding inappropriate risks and dangers.

**6.1.3** assumes some responsibility for his/her own health and the health and well being of others.

**Benchmark - Changes in the environment.**

**6.2.2** develops personal actions to solve pollution problems in and around the neighborhood.

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Awareness that people practice science**

**7.1.2** studies the lives of people who made scientific contributions.

**Fifth Grade**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Scientific inquiry.**

- 1.1.4 communicates scientific procedure, results, and explanations
- 1.1.3 identifies the relationship between evidence and logical conclusions.  
designs and conducts scientific investigations safely using appropriate tools, mathematics, technology, and techniques to
- 1.1.2 gather, analyze, and interpret data.
- 1.1.1 identifies questions that can be answered through scientific investigations.

**Benchmark - Different kinds of investigations to different kinds of questions.**

- 1.2.2 differentiates between qualitative and quantitative data in an investigation.
- 1.2.1 develops questions and adapts (frames) the inquiry process to guide the appropriate type of investigation

**Benchmark - Interaction of new ideas, scientific investigations, skepticism, and examinations of evidence of varied explanations**

- evaluates the work of others to determine evidence which scientifically supports or contradicts the results identifying
- 1.3.2 faulty reasoning or conclusions that go beyond evidence and/or are not supported by data.
- 1.3.1 after completing an investigation generates alternative methods of investigation and/or further questions for inquiry.

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Observe, compare and classify properties of matter**

- 2.1.1 compares and classifies the states of matter: solids, liquids, gases and plasma.

**Benchmark - Observe, measure, infer, and classify changes in properties of matter**

- 2.2.2 measures and graphs the effects of temperature on matter

**Benchmark - Investigates motion and forces**

- 2.3.4 investigates how simple machines multiply force at the expense of distance.

**Benchmark - Understand and demonstrate the transfer of energy**

- 2.4.1 understands the difference between potential and kinetic energy.  
observes and communicates how light (electromagnetic) energy interacts with matter: transmitted, reflected, refracted,
- 2.4.3 and absorbed.

**Standard 3. LIFE SCIENCE**

**Benchmark - Identify and relate interactions of populations of organisms within an ecosystem.**

traces the energy flow from the sun (source of radiant energy) to producers (via photosynthesis - chemical energy) to

**3.4.3** consumers and decomposers in food webs.

**3.4.2** understands how limiting factors determine the carrying capacity of an ecosystem.

recognizes that all populations living together (biotic resources) and the physical factors (abiotic resources) with which

**3.4.1** they interact compose an ecosystem.

**Standard 4. EARTH and SPACE SCIENCE**

**Benchmark - Identify and classify stars, planets, and other solar system components**

**4.3.3** identifies past and present methods used to explore space.

**4.3.2** models spatial relationships of the earth/moon/planets/sun system to scale.

**4.3.1** compares and contrasts the characteristics of stars, planets, moons, comets, and asteroids.

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Technological design**

identifies appropriate problems for technological design, designs a solution or product, implements the proposed design,

**5.1.1** evaluates the product, and communicates the process of technological design.

**Benchmark - Similarities, differences, and relationships in science and technology.**

**5.2.3** identifies contributions to science and technology by many people and many cultures.

**5.2.2** evaluates benefits, risks, limitations and trade-offs of technological solutions.

**5.2.1** compares the work of research scientists with that of applied scientists and technologists.

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Scientific knowledge relative to personal health.**

identifies individual nutrition, exercise, and rest needs based on science and uses a scientific approach to thinking critically

**6.1.1** about personal health, lifestyle choices, risks and benefits

**Benchmark - Impact of human activity on resources and environment**

**6.2.1** investigates the effects of human activities on the environment and bases decisions on knowledge of benefits and risks.

**Benchmark - Dynamic examples of earth processes which cause us to evaluate risks.**

**6.3.2** evaluates risks and defines appropriate actions associated with the natural hazard.

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**6.3.1** recognizes patterns of natural processes and/or human activities that may cause and/or contribute to natural hazards.

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Scientific habits of mind**

practices intellectual honesty, demonstrates skepticism appropriately, displays open-mindedness to new ideas, and bases

**7.1.1** decisions on evidence.

**Benchmark - Research contributions to science throughout history**

recognizes that new knowledge leads to new questions, and new discoveries, replicates historic experiments to

**7.2.1** understand principles of science, and relates contributions of men and women to the fields of science.

**Sixth Grade**

**Standard 1. SCIENCE AS INQUIRY**

**Benchmark - Scientific inquiry.**

- 1.1.4 communicates scientific procedure, results, and explanations
- 1.1.3 identifies the relationship between evidence and logical conclusions.  
designs and conducts scientific investigations safely using appropriate tools, mathematics, technology, and techniques to
- 1.1.2 gather, analyze, and interpret data.
- 1.1.1 identifies questions that can be answered through scientific investigations.

**Benchmark - Different kinds of investigations to different kinds of questions.**

- 1.2.2 differentiates between qualitative and quantitative data in an investigation.
- 1.2.1 develops questions and adapts (frames) the inquiry process to guide the appropriate type of investigation

**Benchmark - Interaction of new ideas, scientific investigations, skepticism, and examinations of evidence of varied explanations**

- evaluates the work of others to determine evidence which scientifically supports or contradicts the results identifying
- 1.3.2 faulty reasoning or conclusions that go beyond evidence and/or are not supported by data.
- 1.3.1 after completing an investigation generates alternative methods of investigation and/or further questions for inquiry.

**Standard 2. PHYSICAL SCIENCE**

**Benchmark - Observe. compare and classify properties of matter**

- 2.1.3 identifies and communicates properties of matter including but not limited to, boiling point, solubility, and density.
- 2.1.2 compares and contrasts the classes of matter; elements, compounds, and mixtures.
- 2.1.1 compares and classifies the states of matter; solids, liquids, gases, and plasma

**Benchmark - Observe, measure, infer, and classify changes in properties of matter.**

- 2.2.2 measures and graphs the effects of temperature on matter.
- 2.2.1 understands the relationship of atoms to elements and elements to compounds. (Introduction only.)

**Standard 3. LIFE SCIENCE**

**Benchmark - Model structures of organisms and relate functions to the structures.**

- 3.1.4 concludes that breakdowns in structure or function may be caused by disease, damage, heredity, or aging.

**Benchmark - Describe homeostasis, the regulation and balance of internal conditions in response to a changing external environment.**

- 3.3.1 understands that internal and/or environmental conditions affect an organism's behavior and/or response in order to maintain and regulate stable internal conditions to survive in a continually changing environment.
- 3.3.2 recognizes that the survival of all organisms requires the ingestion of materials, the intake and release of energy, growth, release of wastes and responses to environmental change.

**Benchmark - Diversity of living things and relate their adaptations to their survival or extinction.**

- 3.5.2 understands that adaptations of organisms (changes in structure, function, or behavior that accumulate over successive generations) contribute to biological diversity.
- 3.5.3 associates extinction of a species with environmental changes and insufficient adaptive characteristics.

**Standard 4. EARTH and SPACE SCIENCE**

**Benchmark - Earth system is continuously changing due to earth's physical and chemical processes.**

- 4.1.1 identifies properties of the solid earth, the oceans and fresh water, and the atmosphere.
- 4.1.2 models earth's cycles, constructive and destructive processes, and weather systems.

**Benchmark - Earth processes and their similarity.**

- 4.2.1 understands that earth processes observed today (including movement of lithospheric plates and changes in atmospheric conditions) are similar to those that occurred in the past; earth history is also influenced by occasional catastrophes, such as the impact of a comet or asteroid.

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Technological design**

- 5.1.1 identifies appropriate problems for technological design, designs a solution or product, implements the proposed design, evaluates the product, and communicates the process of technological design.

**Benchmark - Similarities, differences, and relationships in science and technology.**

- 5.2.3 identifies contributions to science and technology by many people and many cultures.
- 5.2.2 evaluates benefits, risks, limitations and trade-offs of technological solutions.
- 5.2.1 compares the work of research scientists with that of applied scientists and technologists.

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Scientific knowledge relative to personal health.**

- 6.1.1 identifies individual nutrition, exercise, and rest needs based on science and uses a scientific approach to thinking critically about personal health, lifestyle choices, risks and benefits

**Benchmark - Impact of human activity on resources and environment**

- 6.2.1 investigates the effects of human activities on the environment and bases decisions on knowledge of benefits and risks.

**Benchmark - Dynamic examples of earth processes which cause us to evaluate risks.**

- 6.3.2 evaluates risks and defines appropriate actions associated with the natural hazard.

- 6.3.1 recognizes patterns of natural processes and/or human activities that may cause and/or contribute to natural hazards.

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Scientific habits of mind**

- 7.1.1 practices intellectual honesty, demonstrates skepticism appropriately, displays open-mindedness to new ideas, and bases decisions on evidence.

**Benchmark - Research contributions to science throughout history**

- 7.2.1 recognizes that new knowledge leads to new questions, and new discoveries, replicates historic experiments to understand principles of science, and relates contributions of men and women to the fields of science.

## Seventh Grade

### **Benchmark - Scientific inquiry.**

- 1.1.4 communicates scientific procedure, results, and explanations
- 1.1.3 identifies the relationship between evidence and logical conclusions.  
designs and conducts scientific investigations safely using appropriate tools, mathematics, technology, and techniques to
- 1.1.2 gather, analyze, and interpret data.
- 1.1.1 identifies questions that can be answered through scientific investigations.

### **Benchmark - Interaction of new ideas, scientific investigations, skepticism, and examinations of evidence of varied explanations**

- evaluates the work of others to determine evidence which scientifically supports or contradicts the results identifying
- 1.3.2 faulty reasoning or conclusions that go beyond evidence and/or are not supported by data.

## **Standard 2. PHYSICAL SCIENCE**

### **Benchmark - Observe, measure, infer, and classify changes in properties of matter.**

- 2.2.1 understands the relationship of atoms to elements and elements to compounds.

### **Benchmark - Investigate motion and forces.**

- describes, measures, and represents data on a graph showing the motion of an object (position, direction of motion, speed).
- 2.3.2
- 2.3.3 recognizes and describes examples of Newton's Laws of Motion.

### **Benchmark - Understand and demonstrate the transfer of energy.**

- understands that when work is done energy transforms from one form to another, including mechanical, heat, light, sound, electrical, chemical, and nuclear energy, yet is conserved.
- 2.4.2
- 2.4.4 understands that heat energy can be transferred from hot to cold by radiation, convection, and conduction.

## **Standard 3. LIFE SCIENCE**

### **Benchmark - Model structures of organisms and relate functions to the structures.**

- will understand the cell theory; that all organisms are composed of one or more cells, cells are the basic unit of life, and
- 3.1.1 that cells come from other cells.
- 3.1.2 relates the structure of cells, organs, tissues, organ systems, and whole organisms to their functions

### **Benchmark - Reproduction and heredity for all living things.**

**3.2.1** differentiates between asexual and sexual reproduction of organisms.

**Benchmark - Identify and relate interactions of populations of organisms within an ecosystem.**

traces the energy flow from the sun (source of radiant energy) to producers (via photosynthesis - chemical energy) to

**3.4.3** consumers and decomposers in food webs.

**Standard 4. EARTH and SPACE SCIENCE**

**Benchmark - Model motions and identify forces that explain Earth phenomena**

demonstrates and models object/space/time relationships that explain phenomena such as the day, the month, the year,

**4.4.1** season phases of the moon, eclipses, and tides.

**Standard 5. SCIENCE AND TECHNOLOGY**

**Benchmark - Technological design**

identifies appropriate problems for technological design, designs a solution or product, implements the proposed design,

**5.1.1** evaluates the product, and communicates the process of technological design.

**Standard 6. SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES**

**Benchmark - Scientific knowledge relative to personal health.**

identifies individual nutrition, exercise, and rest needs based on science and uses a scientific approach to thinking critically

**6.1.1** about personal health, lifestyle choices, risks and benefits

**Benchmark - Impact of human activity on resources and environment**

**6.2.1** investigates the effects of human activities on the environment and bases decisions on knowledge of benefits and risks.

**Standard 7. HISTORY AND NATURE OF SCIENCE**

**Benchmark - Research contributions to science throughout history**

recognizes that new knowledge leads to new questions, and new discoveries, replicates historic experiments to

**7.2.1** understand principles of science, and relates contributions of men and women to the fields of science.

## **Eighth Grade**

### **Standard 1. Science as Inquiry**

#### **Benchmark - Scientific inquiry**

- designs investigations, including developing questions, gathering and analyzing data, and designing and conducting
- 1.1.2** research.
- 1.1.3** actively engages in using technological tools and mathematics in their own scientific investigations.

### **Standard 2a. Chemistry**

#### **Benchmark - Structure of the atom**

- understands atoms the fundamental organizational unit of matter, are composed of subatomic particles. Chemists are
- 2a.1.1** primarily interested in the protons, electrons, and neutrons found in the atom.

#### **Benchmark - States and properties of matter.**

- understands chemists use kinetic and potential energy to explain the physical and chemical properties of matter on earth
- 2a.2.1** that may exist in any of these three states: solids, liquids, and gases.
- 2a.2.2** understands the periodic table lists elements according to increasing atomic number. This table organizes physical and chemical trends by groups, periods, and sub-categories.
- 2a.2.3** understands chemical bonds result when valence electrons are transferred or shared between atoms. Breaking a chemical bond requires energy. Formation of a chemical bond releases energy. Ionic compounds result from atoms transferring electrons. Molecular compounds result from atoms sharing electrons.

#### **Benchmark - Concept of chemical reactions.**

- understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products). There are different types of chemical reactions all of which demonstrate the Law of Conservation
- 2a.3.1** of Matter and Energy.

### **Standard 2b. Physics**

#### **Benchmark - Relationships between force and motion.**

- understands Newton's Laws and the kinematic variables of time, position, velocity, and acceleration can be used to
- 2b.1.1** describe the position and motion of particles.

#### **Benchmark - Conservation of mass and energy and First and Second Laws of Thermodynamics**

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- understands the first law of thermodynamics states the total internal energy of a substance (the sum of all the kinetic and potential energies of its constituent molecules) will change only if heat is exchanged with the environment or work is done on or by the substance. In any physical interaction, the total energy in the universe is conserved.
- 2b.2.2**

**Benchmark - Interactions of matter and energy.**

- 2b.3.2** understands waves have energy and can transfer energy when they interact with matter.
- 2b.3.5** understands electromagnetic waves result when a charged particle is accelerated or decelerated.

**Standard 3. Life Science**

**Benchmark - Structure and function of the cell.**

- 3.1.2** understands cell functions involve specific chemical reactions.

**Benchmark - Chromosomes, genes, and the molecular basis of heredity.**

- understands living organisms contain DNA or RNA as their genetic material which provides the instructions that specify the characteristics of organisms.
- 3.2.1**
- 3.2.3** understands hereditary information is contained in genes, located in the chromosomes of each cell.

**Benchmark - Theory of biological evolution.**

- understands biological evolution, descent with modification, is a scientific explanation for the history of the diversification of organisms from common ancestors.
- 3.3.1**
- understands biological evolution is used to explain the earth's present day biodiversity: the number, variety and variability of organisms.
- 3.3.3**
- 3.3.4** understands organisms vary widely within and between populations. Variation allows for natural selection to occur.

**Benchmark - Interdependence of organisms and their interaction with the physical environment.**

- understands atoms and molecules on the earth cycle among the living and nonliving components of the biosphere.
- understands the distribution and abundance of organisms and populations in ecosystems are limited by the carrying capacity.
- 3.4.1**
- 3.4.3**

**Benchmark - Matter energy and organization in living systems.**

- 3.5.2** understands the sun is the primary source of energy for life through the process of photosynthesis.

**3.5.3** understands food molecules contain biochemical energy, which is then available for cellular respiration.

**Benchmark - The student will understand the behavior of animals.**

**3.6.1** understands animals have behavioral responses to internal changes and to external stimuli.

**Benchmark - Diversity of structure and function in organisms.**

understands that homeostasis is the dynamic regulation and balance of an organisms internal environment to maintain

**3.7.2** conditions suitable for survival.

**3.7.3** understands that living things change following a specific pattern of developmental stages called life cycles.

**Standard 4. Earth and Space Science**

**Benchmark - Energy that power the subsystems and cycles of the dynamic Earth: the geosphere, hydrosphere, atmosphere, and biosphere.**

**4.1.2** understands the theory of Plate Tectonics explains that internal energy drives the Earth's ever changing structure.

**Benchmark - Origin and development of the dynamic Earth system.**

**4.2.1** understands geological time is used to understand the earth's past.

**Benchmark - Dynamics of our solar system**

**4.3.2** understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.

**Benchmark - Organization of the universe and its development.**

**4.4.1** understands stellar evolution.

**Standard 5. Science and Technology**

**Benchmark - Understanding that technology is applied science.**

**5.1.1** understands technology is the application of scientific knowledge for functional purposes.

**Standard 6. Science in Personal and Environmental Perspectives**

**Benchmark - Human populations use natural resources and influence environmental quality.**

**6.3.1** understands natural resources from the lithosphere and ecosystems are required to sustain human populations.

## Physical Science

### Standard 1. Science as Inquiry

#### Benchmark - Scientific inquiry

designs investigations, including developing questions, gathering and analyzing data, and designing and conducting

1.1.2 research.

1.1.3 actively engages in using technological tools and mathematics in their own scientific investigations.

### Standard 2a. Chemistry

#### Benchmark - Structure of the atom

understands atoms the fundamental organizational unit of matter, are composed of subatomic particles. Chemists are

2a.1.1 primarily interested in the protons, electrons, and neutrons found in the atom.

#### Benchmark - States and properties of matter.

understands chemists use kinetic and potential energy to explain the physical and chemical properties of matter on earth

2a.2.1 that may exist in any of these three states: solids, liquids, and gases.

understands the periodic table lists elements according to increasing atomic number. This table organizes physical and

2a.2.2 chemical trends by groups, periods, and sub-categories.

understands chemical bonds result when valence electrons are transferred or shared between atoms. Breaking a chemical bond requires energy. Formation of a chemical bond releases energy. Ionic compounds result from atoms transferring

2a.2.3 electrons. Molecular compounds result from atoms sharing electrons.

#### Benchmark - Concept of chemical reactions.

understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products). There are different types of chemical reactions all of which demonstrate the Law of Conservation

2a.3.1 of Matter and Energy.

### Standard 2b. Physics

#### Benchmark - Relationships between force and motion.

understands Newton's Laws and the kinematic variables of time, position, velocity, and acceleration can be used to

2b.1.1 describe the position and motion of particles.

#### Benchmark - Conservation of mass and energy and First and Second Laws of Thermodynamics

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understands the first law of thermodynamics states the total internal energy of a substance (the sum of all the kinetic and potential energies of its constituent molecules) will change only if heat is exchanged with the environment or work is done on or by the substance. In any physical interaction, the total energy in the universe is conserved.

**2b.2.2**

**Benchmark - Interactions of matter and energy.**

**2b.3.2** understands waves have energy and can transfer energy when they interact with matter.

**2b.3.5** understands electromagnetic waves result when a charged particle is accelerated or decelerated.

**Standard 4. Earth and Space Science**

**Benchmark - Energy that power the subsystems and cycles of the dynamic Earth: the geosphere, hydrosphere, atmosphere, and biosphere.**

**4.1.2** understands the theory of Plate Tectonics explains that internal energy drives the Earth's ever changing structure.

**Benchmark - Origin and development of the dynamic Earth system.**

**4.2.1** understands geological time is used to understand the earth's past.

**Benchmark - Dynamics of our solar system**

**4.3.2** understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.

**Benchmark - Organization of the universe and its development.**

**4.4.1** understands stellar evolution.

**Standard 5. Science and Technology**

**Benchmark - Understanding that technology is applied science.**

**5.1.1** understands technology is the application of scientific knowledge for functional purposes.

**Standard 6. Science in Personal and Environmental Perspectives**

**Benchmark - Human populations use natural resources and influence environmental quality.**

**6.3.1** understands natural resources from the lithosphere and ecosystems are required to sustain human populations.

**Earth/Space Science**

**Standard 1. Science as Inquiry**

**Benchmark - Scientific inquiry**

- designs investigations, including developing questions, gathering and analyzing data, and designing and conducting research.
- 1.1.2** research.
- 1.1.3** actively engages in using technological tools and mathematics in their own scientific investigations.  
actively engages in conducting an inquiry, formulating and revising his or her scientific explanations, and models (physical, conceptual or mathematical) using logic and evidence, and recognizing that potential alternative explanations and models should be considered.
- 1.1.4** should be considered.

**Standard 2a. Chemistry**

**Benchmark - Structure of the atom**

- understands atoms the fundamental organizational unit of matter, are composed of subatomic particles. Chemists are primarily interested in the protons, electrons, and neutrons found in the atom.
- 2a.1.1** primarily interested in the protons, electrons, and neutrons found in the atom.
- understands isotopes are atoms with the same atomic number (same number of protons) but different numbers of neutrons. The nuclei of some atoms are radioactive isotopes that spontaneously decay, releasing radioactive energy.
- 2a.1.2** neutrons. The nuclei of some atoms are radioactive isotopes that spontaneously decay, releasing radioactive energy.

**Benchmark - States and properties of matter.**

- understands the periodic table lists elements according to increasing atomic number. This table organizes physical and chemical trends by groups, periods, and sub-categories.
- 2a.2.2** understands chemical bonds result when valence electrons are transferred or shared between atoms. Breaking a chemical bond requires energy. Formation of a chemical bond releases energy. Ionic compounds result from atoms transferring electrons. Molecular compounds result from atoms sharing electrons.
- 2a.2.3** electrons. Molecular compounds result from atoms sharing electrons.

**Standard 2b. Physics**

**Benchmark - Conservation of mass and energy and First and Second Laws of Thermodynamics**

- understands matter has energy. Mass and energy can be interchanged. The total energy in the universe is constant, but the type of energy may vary.
- 2b.2.1** the type of energy may vary.

**Benchmark - Interactions of matter and energy.**

- 2b.3.2** understands waves have energy and can transfer energy when they interact with matter.
- 2b.3.3** understands interference - how waves interact with other waves.

**Standard 4. Earth and Space Science**

**Benchmark - Energy that power the subsystems and cycles of the dynamic Earth: the geosphere, hydrosphere, atmosphere, and biosphere.**

**4.1.1** understands constructive and destructive processes, including weathering, erosion and deposition, dynamically reshape the surface of the earth.

**4.1.2** understands the theory of Plate Tectonics explains that internal energy drives the Earth's ever changing structure.

**4.1.3** understands that the ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and the earth's rotation.

**4.1.4** understands the processes of water cycling through surface water (oceans, lakes, streams, glaciers), ground water (aquifers), and the atmosphere. (hydrological cycle)

**Benchmark - Origin and development of the dynamic Earth system.**

**4.2.1** understands geological time is used to understand the earth's past.

**Benchmark - Dynamics of our solar system**

**4.3.1** understands gravitational attraction of objects in the solar system keeps solar system objects in orbit.

**4.3.2** understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.

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

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

**Benchmark - Organization of the universe and its development.**

**4.4.1** understands stellar evolution.

**4.4.2** understands the current scientific explanation of the origin and structure of the universe.

**4.4.3** understand how the tools of astronomy have revolutionized the study of the universe.

**Standard 5. Science and Technology**

**Benchmark - Understanding that technology is applied science.**

**5.1.1** understands technology is the application of scientific knowledge for functional purposes.

**5.1.2** understands creativity, imagination, and a broad scientific knowledge base are required to produce useful results.

**Standard 6. Science in Personal and Environmental Perspectives**

**Benchmark - Human populations use natural resources and influence environmental quality.**

**6.3.2** understands earth does not have infinite resources.

**Benchmark - Natural and human-influenced hazards.**

**6.4.1** understands that natural processes on the earth may be hazardous for humans.

**Standard 7. History and Nature of Science**

**Benchmark - Science is a human endeavor that uses models to describe and explain the physical universe.**

recognizes the universality of basic science concepts and the influence of personal and cultural beliefs that embed science in society.

**7.1.3**

recognizes that society helps create the ways of thinking (mindsets) required for scientific advances, both toward training scientists and educating a populace to utilize benefits of science (e.g., standards of hygiene, attitudes toward forces of

**7.1.4** nature, etc.).

**Benchmark - Nature of scientific knowledge.**

understands scientific knowledge describes and explains the physical world in terms of matter, energy, and forces.

**7.2.1** Scientific knowledge is provisional and is subject to change as new evidence becomes available.

understands scientific knowledge begins with empirical observations, which are the data (also called facts or evidence)

**7.2.2** upon which further scientific knowledge is built.

**7.2.3** understands scientific knowledge consists of hypotheses, inferences, laws, and theories.

**7.2.4** understands a testable hypothesis or inference must be subject to confirmation by empirical evidence.

**Benchmark - Science from historical perspectives.**

**7.3.1** demonstrates an understanding of the history of science.

## **Biology**

### **Standard 1. Science as Inquiry**

#### **Benchmark - Scientific inquiry**

- 1.1.1** actively engages in asking and evaluating research questions.  
designs investigations, including developing questions, gathering and analyzing data, and designing and conducting
- 1.1.2** research.
- 1.1.3** actively engages in using technological tools and mathematics in their own scientific investigations.  
actively engages in conducting an inquiry, formulating and revising his or her scientific explanations, and models (physical, conceptual or mathematical) using logic and evidence, and recognizing that potential alternative explanations and models
- 1.1.4** should be considered.
- 1.1.5** actively engages in communicating and defending the design, results, and conclusion of his/her investigation.

### **Standard 2a. Chemistry**

#### **Benchmark - Structure of the atom**

- 2a.1.1** understands atoms the fundamental organizational unit of matter, are composed of subatomic particles. Chemists are primarily interested in the protons, electrons, and neutrons found in the atom.
- 2a.1.2** understands isotopes are atoms with the same atomic number (same number of protons) but different numbers of neutrons. The nuclei of some atoms are radioactive isotopes that spontaneously decay, releasing radioactive energy.

#### **Benchmark - States and properties of matter.**

- 2a.2.1** understands chemists use kinetic and potential energy to explain the physical and chemical properties of matter on earth that may exist in any of these three states: solids, liquids, and gases.
- 2a.2.2** understands the periodic table lists elements according to increasing atomic number. This table organizes physical and chemical trends by groups, periods, and sub-categories.
- 2a.2.3** understands chemical bonds result when valence electrons are transferred or shared between atoms. Breaking a chemical bond requires energy. Formation of a chemical bond releases energy. Ionic compounds result from atoms transferring electrons. Molecular compounds result from atoms sharing electrons.

#### **Benchmark - Concept of chemical reactions.**

- 2a.3.1** understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products). There are different types of chemical reactions all of which demonstrate the Law of Conservation of Matter and Energy.

- understands how to perform mathematical calculations regarding the Law of Conservation of Matter, i.e. through stoichiometric relationships.
- 2a.3.2** understands the differences and reactions between acids, bases and salts. Perform calculations to determine the concentration of ions in solutions.
- 2a.3.3**

**Standard 2b. Physics**

**Benchmark - Relationships between force and motion.**

- understands Newton's Laws and the kinematic variables of time, position, velocity, and acceleration can be used to describe the position and motion of particles.
- 2b.1.1**

**Benchmark - Conservation of mass and energy and First and Second Laws of Thermodynamics**

- understands the first law of thermodynamics states the total internal energy of a substance (the sum of all the kinetic and potential energies of its constituent molecules) will change only if heat is exchanged with the environment or work is done on or by the substance. In any physical interaction, the total energy in the universe is conserved.
- 2b.2.2**

**Benchmark - Interactions of matter and energy.**

- 2b.3.2** understands waves have energy and can transfer energy when they interact with matter.
- 2b.3.5** understands electromagnetic waves result when a charged particle is accelerated or decelerated.

**Standard 3. Life Science**

**Benchmark - Structure and function of the cell.**

- 3.1.1** understands cells are composed of a variety of specialized structures that carry out specific functions.
- 3.1.2** understands cell functions involve specific chemical reactions.
- 3.1.3** understands cells function and replicate as a result of information stored in (DNA) and (RNA) molecules.
- 3.1.4** understands some plant cells contain chloroplasts which are the sites of photosynthesis.
- 3.1.5** understands cells can differentiate thereby enabling complex multicellular organisms to form.

**Benchmark - Chromosomes, genes, and the molecular basis of heredity.**

- understands living organisms contain DNA or RNA as their genetic material which provides the instructions that specify the characteristics of organisms.
- 3.2.1**
- understands organisms usually have a characteristic number of chromosomes; one pair of these may determine the sex of individuals.
- 3.2.2**
- understands hereditary information is contained in genes, located in the chromosomes of each cell.
- 3.2.3**

**3.2.4** understands gametes carry the genetic information to the next generation.

**3.2.5** understands expressed mutations occur in DNA at very low rates.

**Benchmark - Theory of biological evolution.**

understands biological evolution, descent with modification, is a scientific explanation for the history of the diversification

**3.3.1** of organisms from common ancestors.

understands populations of organisms may adapt to environmental challenges and changes as a result of natural selection,

**3.3.2** genetic drift, and various mechanisms of genetic change.

understands biological evolution is used to explain the earth's present day biodiversity: the number, variety and variability

**3.3.3** of organisms.

**3.3.4** understands organisms vary widely within and between populations. Variation allows for natural selection to occur.

**3.3.5** understands that the primary mechanism acting on variation is natural selection.

**3.3.6** understands biological evolution is used as a broad, unifying theoretical framework for biology.

**Benchmark - Interdependence of organisms and their interaction with the physical environment.**

**3.4.1** understands atoms and molecules on the earth cycle among the living and nonliving components of the biosphere.

**3.4.2** understands energy is received, transformed and expended in ecosystems.

understands the distribution and abundance of organisms and populations in ecosystems are limited by the carrying

**3.4.3** capacity.

**3.4.4** understands organisms cooperate and compete in complex interdependent relationships.

**3.4.5** understands human beings live within and impact ecosystems.

**Benchmark - Matter energy and organization in living systems.**

**3.5.1** understands living systems require a continuous input of energy to maintain their chemical and physical organization.

**3.5.2** understands the sun is the primary source of energy for life through the process of photosynthesis.

**3.5.3** understands food molecules contain biochemical energy, which is then available for cellular respiration.

understands the structure and function of an organism serve to acquire, transform, transport, release and eliminate the

**3.5.4** matter and energy used to sustain the organism.

**Benchmark - The student will understand the behavior of animals.**

**3.6.1** understands animals have behavioral responses to internal changes and to external stimuli.

**3.6.2** understands most multicellular animals have nervous systems that underlie behavior.

**3.6.3** understands behaviors are often adaptive when viewed in terms of survival and reproductive success.

**Benchmark - Diversity of structure and function in organisms.**

understands differences in structure and function among organisms and can identify the characteristics of relevant life forms.

**3.7.1**

understands that homeostasis is the dynamic regulation and balance of an organism's internal environment to maintain conditions suitable for survival.

**3.7.2**

**3.7.3** understands that living things change following a specific pattern of developmental stages called life cycles.

understands that in complex organisms there is a division of labor into specific body systems, i.e. respiration, digestion, nervous, endocrine, excretion, circulatory, reproductive, immune, skeletal and muscle.

**3.7.4**

understands taxonomy is the systematic way in which organisms are placed into a hierarchical classification system, according to their physical and genetic characteristics and their evolutionary history.

**3.7.5**

**Standard 4. Earth and Space Science**

**Benchmark - Energy that powers the subsystems and cycles of the dynamic Earth: the geosphere, hydrosphere, atmosphere, and biosphere.**

understands constructive and destructive processes, including weathering, erosion and deposition, dynamically reshape the surface of the earth.

**4.1.1**

**4.1.2** understands the theory of Plate Tectonics explains that internal energy drives the Earth's ever changing structure.

understands that the ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and the earth's rotation.

**4.1.3**

understands the processes of water cycling through surface water (oceans, lakes, streams, glaciers), ground water (aquifers), and the atmosphere. (hydrological cycle)

**4.1.4**

**Benchmark - Origin and development of the dynamic Earth system.**

**4.2.1** understands geological time is used to understand the earth's past.

**Benchmark - Dynamics of our solar system**

**4.3.2** understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.

**Benchmark - Organization of the universe and its development.**

4.4.1 understands stellar evolution.

**Standard 5. Science and Technology**

**Benchmark - Understanding that technology is applied science.**

5.1.1 understands technology is the application of scientific knowledge for functional purposes.

5.1.2 understands creativity, imagination, and a broad scientific knowledge base are required to produce useful results.

5.1.3 understands science advances new technologies. New technologies open new areas for scientific inquiry.

**Standard 6. Science in Personal and Environmental Perspectives**

**Benchmark - Overall functioning of human systems and their interaction with the environment**

6.1.1 understands some chemical and physical hazards and accidents can be avoided through safety education.

**Benchmark - Population growth**

understands the rate of change in populations is determined by the combined effects of birth, death, emigration, and

6.2.1 immigration.

6.2.2 understands a variety of factors influence birth rates and fertility rates.

6.2.3 understands populations have limits to growth.

**Benchmark - Human populations use natural resources and influence environmental quality.**

6.3.1 understands natural resources from the lithosphere and ecosystems are required to sustain human populations.

6.3.2 understands earth does not have infinite resources.

**Benchmark - Natural and human-influenced hazards.**

6.4.1 understands that natural processes on the earth may be hazardous for humans.

6.4.2 understands there is a need to assess potential risk and danger from natural and human-induced hazards.

**Benchmark - Relationship between science, technology and society.**

understands progress in science and technology can be affected by social issues and challenges. Science and technology

6.5.1 indicate what can happen, not what should happen.

**Standard 7. History and Nature of Science**

**Benchmark - Science from historical perspectives.**

**7.3.1** demonstrates an understanding of the history of science.

**Human Anatomy and Physiology**

**Standard 3. Life Science**

**Benchmark - Structure and function of the cell.**

- 3.1.1 understands cells are composed of a variety of specialized structures that carry out specific functions.
- 3.1.2 understands cell functions involve specific chemical reactions.
- 3.1.3 understands cells function and replicate as a result of information stored in (DNA) and (RNA) molecules.
- 3.1.5 understands cells can differentiate thereby enabling complex multicellular organisms to form.

**Benchmark - Chromosomes, genes, and the molecular basis of heredity.**

- understands living organisms contain DNA or RNA as their genetic material which provides the instructions that specify the characteristics of organisms.
- 3.2.1
- 3.2.3 understands hereditary information is contained in genes, located in the chromosomes of each cell.

**Benchmark - Matter energy and organization in living systems.**

- 3.5.3 understands food molecules contain biochemical energy, which is then available for cellular respiration.

**Benchmark - The student will understand the behavior of animals.**

- 3.6.1 understands animals have behavioral responses to internal changes and to external stimuli.

**Benchmark - Diversity of structure and function in organisms.**

- understands that homeostasis is the dynamic regulation and balance of an organisms internal environment to maintain conditions suitable for survival.
- 3.7.2
- 3.7.3 understands that living things change following a specific pattern of developmental stages called life cycles.

## **Chemistry**

### **Standard 1. Science as Inquiry**

#### **Benchmark - Scientific inquiry**

- designs investigations, including developing questions, gathering and analyzing data, and designing and conducting
- 1.1.2** research.
- 1.1.3** actively engages in using technological tools and mathematics in their own scientific investigations.

### **Standard 2a. Chemistry**

#### **Benchmark - Structure of the atom**

- understands atoms the fundamental organizational unit of matter, are composed of subatomic particles. Chemists are
- 2a.1.1** primarily interested in the protons, electrons, and neutrons found in the atom.
- 2a.1.2** understands isotopes are atoms with the same atomic number (same number of protons) but different numbers of neutrons. The nuclei of some atoms are radioactive isotopes that spontaneously decay, releasing radioactive energy.

#### **Benchmark - States and properties of matter.**

- 2a.2.1** understands chemists use kinetic and potential energy to explain the physical and chemical properties of matter on earth that may exist in any of these three states: solids, liquids, and gases.
- 2a.2.2** understands the periodic table lists elements according to increasing atomic number. This table organizes physical and chemical trends by groups, periods, and sub-categories.
- 2a.2.3** understands chemical bonds result when valence electrons are transferred or shared between atoms. Breaking a chemical bond requires energy. Formation of a chemical bond releases energy. Ionic compounds result from atoms transferring electrons. Molecular compounds result from atoms sharing electrons.

#### **Benchmark - Concept of chemical reactions.**

- 2a.3.1** understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products). There are different types of chemical reactions all of which demonstrate the Law of Conservation of Matter and Energy.
- 2a.3.2** understands how to perform mathematical calculations regarding the Law of Conservation of Matter, i.e. through stoichiometric relationships.
- 2a.3.3** understands the differences and reactions between acids, bases and salts. Perform calculations to determine the concentration of ions in solutions.

#### **Benchmark - Process of Naming Chemical Compounds**

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- 2a.5.a Naming ions, ionic compounds, and ionic compounds involving elements with multiple oxidation states (Stock system)
- 2a.5.b Naming covalently bonded compounds using the numerical prefix system.

**Standard 2b. Physics**

**Benchmark - Conservation of mass and energy and First and Second Laws of Thermodynamics**

understands matter has energy. Mass and energy can be interchanged. The total energy in the universe is constant, but the

- 2b.2.1 type of energy may vary.
- 2b.2.3 understands the second law of thermodynamics states the entropy of the universe is increasing.

**Standard 5. Science and Technology**

**Benchmark - Understanding that technology is applied science.**

- 5.1.1 understands technology is the application of scientific knowledge for functional purposes.
- 5.1.3 understands science advances new technologies. New technologies open new areas for scientific inquiry.

**Standard 6. Science in Personal and Environmental Perspectives**

**Benchmark - Overall functioning of human systems and their interaction with the environment**

- 6.1.1 understands some chemical and physical hazards and accidents can be avoided through safety education.

**Benchmark - Natural and human-influenced hazards.**

- 6.4.2 understands there is a need to assess potential risk and danger from natural and human-induced hazards.

**Standard 7. History and Nature of Science**

**Benchmark - Science is a human endeavor that uses models to describe and explain the physical universe.**

- 7.1.2 explains how science uses peer review, replication of methods, and norms of honesty.

**Benchmark - Nature of scientific knowledge.**

understands scientific knowledge describes and explains the physical world in terms of matter, energy, and forces.

- 7.2.1 Scientific knowledge is provisional and is subject to change as new evidence becomes available.
- 7.2.2 understands scientific knowledge begins with empirical observations, which are the data (also called facts or evidence) upon which further scientific knowledge is built.
- 7.2.3 understands scientific knowledge consists of hypotheses, inferences, laws, and theories.
- 7.2.4 understands a testable hypothesis or inference must be subject to confirmation by empirical evidence.

**Benchmark - Science from historical perspectives.**

**7.3.1** demonstrates an understanding of the history of science.

## Physics

### Standard 1. Science as Inquiry

#### Benchmark - Scientific inquiry

- 1.1.1 actively engages in asking and evaluating research questions.  
designs investigations, including developing questions, gathering and analyzing data, and designing and conducting
- 1.1.2 research.
- 1.1.3 actively engages in using technological tools and mathematics in their own scientific investigations.  
actively engages in conducting an inquiry, formulating and revising his or her scientific explanations, and models (physical, conceptual or mathematical) using logic and evidence, and recognizing that potential alternative explanations and models
- 1.1.4 should be considered.
- 1.1.5 actively engages in communicating and defending the design, results, and conclusion of his/her investigation.

### Standard 2b. Physics

#### Benchmark - Relationships between force and motion.

- understands Newton's Laws and the kinematic variables of time, position, velocity, and acceleration can be used to
- 2b.1.1 describe the position and motion of particles.
- 2b.1.2 understands physicists use conservation laws to analyze the motion of objects.

#### Benchmark - Conservation of mass and energy and First and Second Laws of Thermodynamics

- understands matter has energy. Mass and energy can be interchanged. The total energy in the universe is constant, but the
- 2b.2.1 type of energy may vary.  
  
understands the first law of thermodynamics states the total internal energy of a substance (the sum of all the kinetic and potential energies of its constituent molecules) will change only if heat is exchanged with the environment or work is done
- 2b.2.2 on or by the substance. In any physical interaction, the total energy in the universe is conserved.

#### Benchmark - Interactions of matter and energy.

- there are four fundamental forces in nature: strong nuclear force, weak nuclear force, electromagnetic force, and
- 2b.3.1 gravitational force.
- 2b.3.2 understands waves have energy and can transfer energy when they interact with matter.
- 2b.3.3 understands interference - how waves interact with other waves.
- 2b.3.4 understands the principles of reflection and refraction.
- 2b.3.5 understands electromagnetic waves result when a charged particle is accelerated or decelerated.

**Standard 5. Science and Technology**

**Benchmark - Understanding that technology is applied science.**

- 5.1.1 understands technology is the application of scientific knowledge for functional purposes.
- 5.1.2 understands creativity, imagination, and a broad scientific knowledge base are required to produce useful results.
- 5.1.3 understands science advances new technologies. New technologies open new areas for scientific inquiry.

**Standard 6. Science in Personal and Environmental Perspectives**

**Benchmark - Relationship between science, technology and society.**

- understands progress in science and technology can be affected by social issues and challenges. Science and technology indicate what can happen, not what should happen.
- 6.5.1

**Standard 7. History and Nature of Science**

**Benchmark - Science is a human endeavor that uses models to describe and explain the physical universe.**

- 7.1.2 explains how science uses peer review, replication of methods, and norms of honesty.  
recognizes that society helps create the ways of thinking (mindsets) required for scientific advances, both toward training scientists and educating a populace to utilize benefits of science (e.g., standards of hygiene, attitudes toward forces of nature, etc.).
- 7.1.4
- 7.1.5 understands there are many issues which involve morals, ethics, values or spiritual beliefs that go beyond what science can explain, but for which solid scientific literacy is useful.

**Benchmark - Nature of scientific knowledge.**

- understands scientific knowledge describes and explains the physical world in terms of matter, energy, and forces.
- 7.2.1 Scientific knowledge is provisional and is subject to change as new evidence becomes available.  
understands scientific knowledge begins with empirical observations, which are the data (also called facts or evidence) upon which further scientific knowledge is built.
- 7.2.2
- 7.2.3 understands scientific knowledge consists of hypotheses, inferences, laws, and theories.
- 7.2.4 understands a testable hypothesis or inference must be subject to confirmation by empirical evidence.

**Benchmark - Science from historical perspectives.**

- 7.3.1 demonstrates an understanding of the history of science.