

# Maryland Science Standards

## K-3

### 2.0 Earth and Space

#### Materials that shape the planet

2.3.1 Identify that earth materials (ie. soils & rocks) change and explain what causes those changes (e.g. weather and erosion)

*Change in wording:*

**2.3.1 describe the properties of Earth materials (i.e., soils, rocks, water, explain how they change, and what causes those changes (i.e., weather and erosion).**

#### Earth History

2.3.2 Classify rocks based on size and shapes from boulders to grains of sand and even smaller.

*SAME:*

**2.3.2 classify rocks based on sizes and shapes from boulders to grains of sand and even smaller.**

2.3.4 Explain that Fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.

*# change only:*

**2.3.5 explain that fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.**

#### Plate Tectonics

2.3.5 Identify and classify a variety of earth surface features that are land forms (e.g. hills, mountains, valleys, continents) and water systems (e.g. rivers and oceans)

*# change only:*

**2.3.6 identify and classify a variety of Earth surface features that are landforms (i.e., hills, mountains, valleys, continents) and water systems (i.e., rivers and oceans).**

**(MLO 2.1)**

2.3.6 Identify, observe, and describe that there are numerous celestial objects (e.g. sun, moon, stars) visible in the sky and that these objects have physical properties, locations, and movements.

*# change only:*

**2.3.7 identify, observe, and describe the numerous celestial objects (i.e., sun, moon, stars) visible in the sky and their physical properties, locations, and movements.**

**(MLO 2.2)**

2.3.8 Observe and describe the repeating pattern of some event in nature (e.g. day, night, seasons, lunar phases, tides).

*# change only:*

**2.3.9 observe and describe the repeating pattern of some events in nature (i.e., day, night, seasons, lunar phases,). (MLO 2.3)**

***New Question:***

**2.3.8 Identify the planets and their relationship to the sun.**

**Interactions of Hydrosphere and Atmosphere**

2.3.11 Identify the sun as a star, the provider of light and the heat necessary to maintain the temperature of the earth.

*# change only:*

***2.3.12 identify the Sun as a star, the provider of light and heat necessary to maintain the temperature of the Earth.***

2.3.12 Describe the weather using observation, age appropriate tools and measurements.

*Change in wording:*

**2.3.13 describe the weather using observations, age appropriate tools (i.e., thermometers) and measurements. (MLO 2.4)**

2.3.13 Predict weather patterns for each season.

*# change only:*

**2.3.14 predict weather patterns for each season. (MLO 2.5).**

# Maryland Science Standards

## K-3

### 3.0 Life Science

#### Cellular

3.3.1 Use magnifying instruments to observe organisms that could not be seen without them.

*SAME:*

**3.3.1** *use magnifying instruments to observe organisms that could not be seen without them.*

3.3.2 Describe examples which show that living organisms have special parts that allow them to perform certain functions

*Change in wording:*

**3.3.2** **describe examples that show that living organisms have special parts (e.g. legs, wings, fins) that allow them to perform certain functions (e.g. walking, flying, swimming). (MLO 3.1)**

3.3.3 Explain that Disease may be caused by germs and prevent the spread of disease

*Same:*

**3.3.3** *explain that diseases may be caused by germs and identify behaviors that prevent the spread of disease.*

#### Genetics

3.3.4 Describe examples which show that offspring are like one another and very much, but not exactly like their parents.

*Change in wording:*

**3.3.4** **describe examples that show that offspring are like one another but not exactly like their parents. (MLO 3.2)**

#### Evolution

3.3.6 Explain that all living things can be compared based on similarities and differences (e.g. external features)

*Change in wording:*

**3.3.6** **explain that all living things can be compared based on similarities and differences (i.e., external features) and distinguish diverse species. (MLO 3.**

#### *New Question*

**3.3.7** *identify characteristics of plants and animals, including extinct organisms that*

*enable them to live in specific environments.*

### **Biochemistry**

3.3.8 Explain that animals need air, water, and food and plants need air, water, and nutrients and light to survive.

*SAME:*

**3.3.8 explain that animals need air, water and food and that plants need air, water, nutrients, and light to survive. (MLO 3.4)**

3.3.9 Describe how animals depend on plants

*SAME:*

**3.3.9 describe how animals depend on plants.**

### **Ecology**

3.3.12 Explain that habitats provide basic needs (e.g. food, water) for the organisms living in them. Living things have basic needs.

*Change in wording:*

**3.3.12 explain that habitats provide basic needs, (i.e., food, water, shelter, energy) for the organisms living in them. (MLO 3.5)**

# Maryland Science Standards

## K-3

### 4.0 Chemistry

#### Structure of Matter

4.3.1 Describe physical properties of materials (e.g. texture, size, color, and shape)

*SAME:*

**4.3.1 describe physical properties of materials (i.e., texture, size, color, shape).  
(MLO 4.1)**

4.3.3 Identify processes (e.g. bending, cutting, heating, rusting, dissolving) that can be used to change properties of materials.

*SAME:*

**4.3.3 identify processes (e.g., bending, cutting, heating, rusting, dissolving) that can be used to change properties of materials.**

#### Classification of Matter

4.3.5 Classify materials based on common properties (e.g. texture, color, hardness)

*New Questions:*

**4.3.4 create mixtures and separate them based on differences in properties.**

**4.3.5 measure, describe, and classify materials based on common properties (e.g., texture, color, hardness, size, weight and shape).**

#### Conservation of Matter and Energy

4.3.6 Give examples that show that **energy** can warm a substance (e.g. sun, stove- top, etc.)

*SAME:*

**4.3.6 give examples that show that energy can warm a substance (e.g. sun, stove- top, etc.)**

# Maryland Science Standards

## K-3

### 5.0 Physics

#### Mechanics

5.3.1 Investigate and explain that energy is needed to make things go, run, or happen (e.g., battery in a toy, pedaling a bicycle).

*SAME:*

**5.3.1** *investigate and explain that energy is needed to make things go, run, or happen (e.g., battery in a toy, pedaling a bicycle).*

5.3.2 Give examples that demonstrate how to change the **motion** of an object by giving it a push or a pull.

*SAME:*

**5.3.2** *give examples that demonstrate how to change the motion of an object by giving it a push or a pull.(MLO 5.1)*

5.3.3 explain that the size of a change in the motion of an object is related to the amount of force of the push or pull.

*SAME:*

**5.3.3** *explain that the size of a change in the motion of an object is related to the amount of force of the push or pull.*

5.3.4 give examples to demonstrate that objects move differently on different surfaces.

*SAME:*

**5.3.4** *give examples to demonstrate that objects move differently on different surfaces.*

5.3.5 give examples of different ways that things move (e.g. straight, round and round, fast and slow).

*SAME:*

**5.3.5** *give examples of different ways that things move (e.g. straight, round and round, fast and slow).*

5.3.6 give examples to demonstrate that things fall to the ground unless something holds them up.

*SAME:*

**5.3.6** *give examples to demonstrate that things fall to the ground unless something holds them up.*

#### Thermodynamics

5.3.7 explain that the sun warms the land, air, and water.

*SAME:*

**5.3.7 explain that the sun warms the land, air, and water. (MLO 5.2)**

5.3.8 identify materials that people use to produce **heat energy** (e.g. fuel, wood, etc.).

*SAME:*

**5.3.8 identify materials that people use to produce heat energy (e.g. fuel, wood, etc.).**

### **Electricity and Magnetism**

5.3.10 identify sources of electricity and list common uses of electricity in daily life (e.g., electrical outlets, batteries, and static electricity).

*SAME:*

**5.3.10 identify sources of electricity and list common uses of electricity in daily life (e.g., electrical outlets, batteries, and static electricity).**

5.3.12 explain that magnets can push or pull (attract or repel) or have no effect on some objects or can cause movement with or without contact.

*SAME:*

**5.3.12 explain that magnets can push or pull (attract or repel) or have no effect on some objects or can cause movement with or without contact. (MLO 5.3)**

### **Missing/New**

**5.3.11 demonstrate that electricity can produce light, heat, sound, and magnetic effects.**

### **Wave Interaction**

5.3.14 Identify things that vibrate and make sound (e.g. guitar strings, voices, drums)

*Change in wording:*

**5.3.14 identify things that vibrate and make sounds (i.e., musical instruments and voices,). (MLO 5.4)**

5.3.16 Identify materials that **light** passes through and materials that block light.

*SAME:*

**5.3.16 identify materials that light passes through and materials that block light.**

## **Maryland Science Standards**

## K-3

### 6.0 Environmental Science

#### Flow Matter and Energy

6.3.1 explain that the amount of water on earth continues to stay the same even though it may change from one form to another. (i.e., water cycle)

*SAME:*

**6.3.1** *explain that the amount of water on earth continues to stay the same even though it may change from one form to another. (i.e., water cycle)*

#### Interdependence of Organisms

6.3.2 explain that organisms can survive only in environments in which their needs (e.g., food, water, and habitat) can be met.

*SAME:*

**6.3.2** *explain that organisms can survive only in environments in which their needs (e.g., food, water, and habitat) can be met.*

#### Natural Resources and Human Needs

6.3.4 explain that Earth's **natural resources** (i.e., fuels, water, air, trees, animals) are taken from the living and non-living environment to meet human needs.

(MLO 6.1)

*SAME:*

**6.3.4** **explain that Earth's natural resources (i.e., fuels, water, air, trees, animals) are taken from the living and non-living environment to meet human needs. (MLO 6.1)**

#### Environmental Issues

6.3.5 explain that using the environment to meet one's wants and needs has consequences (i.e., pollution, extinction)

*SAME:*

**6.3.5** *explain that using the environment to meet one's wants and needs has consequences (i.e., pollution, extinction)*

# Maryland Science Standards

## 4-5

### 1.0. Skills and Processes

#### Scientific Inquiry

1.5.1 Access and process information in order to ask questions that can be answered through scientific investigation.

*New questions:*

**1.5.1 access and process information from readings, investigations, and/or oral communications. (MLO 1.1.1)**

**1.5.2 ask questions that can be answered through a scientific investigation. (MLO 1.1.2)**

1.5.2 Design and safely conduct investigations identifying important variables.

*New questions:*

**1.5.4 recognize/ develop well-designed procedures that identify important variables within an investigation. (MLO 1.1.4)**

**1.5.5 demonstrate safety when conducting an investigation.**

1.5.3 Make metric measurements and use computers and their accessories and demonstrate safety when conducting investigations.

*New questions:*

**1.5.6 use metric units when measuring or collecting data.(MLO 1.1.5)**

**1.5.5 demonstrate safety when conducting an investigation.**

1.5.4 Using appropriate instruments, including calculators, spreadsheets, data-bases and graphing programs, collect, organize and display data to form an explanation based on evidence and scientific principles..

*New questions*

**1.5.7 use appropriate instruments (e.g. calculators, spreadsheets, databases, and graphing programs) to collect, organize, and display on charts, tables, graphs, or with drawings. (MLO 1.1.6)**

**(Refer to questions: 1.5.16)**

1.5.5 Analyze data to form conclusions.

*New questions:*

**1.5.8 analyze data to identify trends and form conclusions. (MLO 1.1.7)**

1.5.6 Interpret and communicate findings through speaking, writing, and drawing using

developmentally appropriate methods including technology tools and telecommunications.

*Change in wording:*

**1.5.9 interpret and communicate findings (i.e., *speaking*, writing, and drawing) in a form suited to the purpose and audience, using developmentally appropriate methods including technology tools and telecommunications. (MLO 1.1.8)**

***NEW QUESTION:***

**1.5.3 use observations and select appropriate scientific information to form predictions and hypotheses. (MLO 1.1.3)**

### **Critical Thinking**

1.5.7 New Section (Applications of Science)

1.5.8 Identify that reasoning can be distorted by inaccurate data and/or strong feelings.

*Change in wording:*

***1.5.12 recognize when reasoning can be distorted by inaccurate data and/or strong feelings.***

1.5.9 Identify that there can be more than one explanation for a set of data

*Change in wording:*

***1.5.13 recognize that there can be more than one explanation for a set of data.***

***NEW Questions:***

**1.5.10 identify similarities and differences of objects, materials, concepts, and actions.**

**(MLO 1.2.1)**

**1.5.11 classify objects, materials, concepts, and actions based on similarities and differences. (MLO 1.2.2) (MLO 1.2.3)**

**1.5.15 recognize and extend patterns found in nature (e.g. crystals, celestial movements).**

**(MLO 1.2.4)**

**1.5.16 modify ideas based on new information from developmentally appropriate readings, data, and the ideas of others. (MLO 1.2.5)**

**1.5.17 describe to others how scientific information was used. (MLO 1.2.6)**

### **Applications of Science**

1.5.7 Apply scientific concepts to make decisions.

*New questions:*

**1.5.18 apply scientific concepts to understand a new situation. (MLO 1.3.1)**

**1.5.20 apply scientific concepts to make decisions. (MLO 1.3.2)**

***NEW Question:***

**1.5.21 use the knowledge of science and available scientific equipment to devise a plan to solve a local problem. (MLO 1.3.3)**

### **Technology**

1.5.10 Explain that observing the changes in models may simulate how real objects act when those same changes are applied..

*# change only:*

**1.5.22 explain that observing the changes in models may simulate how real objects act when those same changes are applied. (MLO 1.4.1)**

1.5.11 Demonstrate and explain that tools enable scientists and others to observe, estimate, measure, collect, communicate scientific data and information (e.g., size, distance, motion)

*# change only:*

**1.5.23 demonstrate and explain that tools enable scientists and others to observe, estimate, measure, collect, and communicate scientific data and information (i.e., size, distance, motion). (MLO 1.4.2)**

1.5.12 Design, plan, and construct things (e.g., instruments, machines, structures, and systems).

*New Question:*

***1.5.24 design, plan, and construct things in response to a particular need or problem (e.g., instruments, machines, structures, and systems).***

1.5.13 Evaluate and modify designs and products while understanding that a solution to one problem can create other problems.

*# change only:*

***1.5.25 evaluate and modify designs and products while explaining how understanding that a solution to one problem can create other problems.***

- 1.5.14 Explain that technology extends the ability of people to change the world (e.g., to cut, shape, or put together materials, to move things from one place to another, and to reach farther with their hands, voices, senses, and minds).  
*# change only:*  
**1.5.26 Explain that technology extends the ability of people to change the world. (e.g., to cut, shape, or put together materials, to move things from one place to another, and to reach farther with their hands, voices, senses, and minds).**

### **History of Science**

- 1.5.15 describe how throughout history science has been a process of thinking and doing in which women and men everywhere could participate and contribute.  
*# change only:*  
**1.5.26 describe how throughout history science has been a process of thinking and doing in which women and men everywhere could participate and contribute.**
- 1.5.15 identify various women and men from a variety of backgrounds and cultures who chose a scientific career.  
**1.5.27 identify various women and men from a variety of backgrounds and cultures who chose a scientific career.**

# Maryland Science Standards

## 4-5

### 2.0. Earth / Space

#### Materials and Process that Shape the Earth

- 2.5.1 Compare how agents of erosion (i.e., water waves, wind, water, and ice) and the deposition of rocks and soil shape and reshape a planet's surface (i.e., canyons, spits, sandbars, submarine canyons, glacial valleys).

*Change in wording:*

- 2.5.1 compare how agents of erosion (i.e., water waves, wind, water, and ice) and the deposition of rocks and soil shape and reshape a planet's surface (i.e., erosion of mountains, canyons, spits, sandbars, submarine canyons, glacial valleys). (MLO 2.1)**

#### Earth History

- 2.5.2 Explain how weathering causes breakage of bedrock and larger rocks into smaller rocks.

*SAME:*

- 2.5.2 explain how weathering causes breakage of bedrock and larger rocks into smaller rocks. (MLO 2.2)**

- 2.5.3 Identify the physical properties of minerals (e.g., color, hardness, luster, and streak).

*SAME:*

- 2.5.3 identify the physical properties of minerals (e.g., color, hardness, luster, and streak).**

- 2.5.4 Explain that for any particular environment, fossils may provide evidence that some plants and animals survive well, some do not survive as well, and some cannot survive at all.

*# change only:*

- 2.5.5 explain that for any particular environment, fossils may provide evidence that some plants and animals survive well, some do not survive as well, and some cannot survive at all.**

## **Plate Tectonics**

2.5.5 Explain that Earth's surface (aquatic and terrestrial) is the result of a combination of constructive and destructive forces (i.e., crustal deformation, volcanic eruptions, earthquakes, deposition of sediment, weathering, and erosion).

*# change only:*

**2.5.6** *explain that Earth's surface (aquatic and terrestrial) is the result of a combination of constructive and destructive forces (i.e., crustal deformation, volcanic eruptions, earthquakes, deposition of sediment, weathering, and erosion).*

## **Astronomy**

2.5.6 Describe how celestial objects (i.e., sun, moon, stars, planets ) differ (i.e., properties, location, and patterns of movement).

*change in wording:*

**2.5.7** **Describe how celestial objects (i.e., sun, moon, stars, planets ) differ (i.e., properties, location, and patterns of movement and change).(MLO 2.2)**

2.5.8 Explain that the patterns of stars in the sky stay the same although they appear to move across the sky in different seasons as the Earth orbits the sun

*# change only:*

**2.5.9** *explain that the patterns of stars in the sky stay the same although they appear to move across the sky in different seasons*

2.5.9 Demonstrate and explain that the rotation of planet Earth produces the night and day cycle.

*# change only:*

**2.5.10** **demonstrate and explain that the rotation of planet Earth produces the night and day cycle. (MLO 2.5)**

2.5.10 Describe the predictable patterns of changing tides.

*# change only:*

**2.5.11** *describe the predictable patterns of changing tides.*

***NEW Question:***

**2.5.8** *describe common objects (i.e. stars, planets, moons,)in the solar system and explain their relationships.*

**Interactions of Hydrosphere and Atmosphere**

2.5.11 Construct, use, and explain that the Sun is the main source of energy that powers the water cycle.

*change in wording:*

**2.5.12** *explain that the Sun is the main source of energy that powers the water cycle and influences surface winds.*

2.5.12 Use age appropriate instruments and/or resources to quantify, collect, and record oceanic weather measurements and oceanic data (i.e., water temperatures, salinity, currents).

*# change only:*

**2.5.13** *use age appropriate instruments and/or resources to quantify, collect, and record oceanic weather measurements and oceanic data (i.e., water temperatures, salinity, currents).*

2.5.13 Use weather measurements (e.g., temperature, wind direction and speed, and precipitation) to explain that each season has different weather patterns.

*# change only:*

**2.5.14** *use weather measurements (e.g., temperature, wind direction and speed, and precipitation) to explain that each season has different weather patterns.*

***NEW Question:***

**2.5.15** *describe the composition and physical characteristics of the Earth's bodies of water, their uses, and importance.*

# Maryland Science Standards

## 4-5

### 3.0 Life Science

#### Cellular

3.5.1 Use magnifying instruments to observe cells (single cell or multi-cellular organisms).

*SAME:*

**3.5.1 use magnifying instruments to observe cells (single cell or multi-cellular organisms).**

3.5.2 Cite evidence that organisms have different structures and systems that serve various functions in growth, survival, and reproduction. (MLO 3.1)

*SAME:*

**3.5.2 cite evidence that organisms have different structures and systems that serve various functions in growth, survival, and reproduction. (MLO 3.1)**

3.5.3 Cite evidence of the body's structure and mechanisms to fight disease (i.e., tears, saliva, skin, blood cells, response to vaccination). (MLO 3.2)

*SAME:*

**3.5.3 cite evidence of the body's structure and mechanisms to fight disease (i.e., tears, saliva, skin, blood cells, response to vaccination). (MLO 3.2)**

#### Genetics

3.5.4 Explain that reproduction is necessary for the inheritance of characteristics and the continuation of a species.

*SAME:*

**3.5.4 explain that reproduction is necessary for the inheritance of characteristics and the continuation of a species. (MLO 3.3).**

3.5.5 Explain that some characteristics are inherited and others result from interactions with the environment.

*SAME:*

**3.5.5 explain that some characteristics are inherited and others result from interactions with the environment.**

## **Evolution**

3.5.6 Describe examples, of organisms and their adaptations, which show that organisms and groups of organisms that are best suited to an environment survive and reproduce.

**SAME:**

**3.5.6 Describe examples, of organisms and their adaptations, which show that organisms and groups of organisms that are best suited to an environment survive and reproduce. (MLO 3.4)**

3.5.7 Cite evidence to support the idea that when the environment changes some plants and animals survive and reproduce and others die or move to other locations.

**SAME:**

**3.5.7 cite evidence to support the idea that when the environment changes some plants and animals survive and reproduce and others die or move to other locations.**

## **Biochemistry**

3.5.8 explain that some source of energy is needed for all organisms to stay active and grow (i.e. sunlight and food).

**SAME:**

**3.5.8 explain that some source of energy is needed for all organisms to stay active and grow (i.e. sunlight and food). (MLO 3.5)**

3.5.9 cite evidence to support the importance of food, water, and air in the structure and function of living things.

**SAME:**

**3.5.9 cite evidence to support the importance of food, water, and air in the structure and function of living things.**

3.5.10 Explain that organisms can cause physical and chemical changes to matter (e.g., digestion, excretion).

**Change in wording:**

**3.5.10 explain that organisms can cause physical and chemical changes to matter (e.g., digestion, growth, excretion).**

## **Ecology**

3.5.12 Cite evidence that individuals and groups of organisms interact with each other and their environment (i.e., food chain, reproduction, decomposition).

**SAME:**

**3.5.12 cite evidence that individuals and groups of organisms interact with each other and their environment (i.e., food chain, reproduction, decomposition). (MLO 3.6)**

3.5.13 Cite evidence that living organisms change environments in ways that can be either beneficial or detrimental to themselves and other living organisms (e.g., food chain, overpopulation, pollination).

***3.5.13 cite evidence that living organisms change environments in ways that can be either beneficial or detrimental to themselves and other living organisms (e.g., food chain, overpopulation, pollination).***

# Maryland Science Standards

## 4-5

### 4.0 Chemistry

#### Structure of Matter

*SAME:*

**4.5.1** *explain that matter is composed of small parts that are too small to be seen without magnification.*

#### Physical or Chemical Changes

*SAME:*

**4.5.3** **identify that matter undergoes physical and chemical changes. (MLO 4.1)**

#### Classification of Matter

*SAME (# / different category):*

**4.5.4** *explain that when a new material is made by combining two or more materials, it has properties that are different from the original.*

4.5.5 Classify materials according to states of matter such as solids, liquids, and gases

*Change in wording:*

**4.5.5** **classify materials according to states of matter such as solids, liquids, and gases and explain how they can change from one to another. (MLO 4.2)**

#### Conservation of Matter and Energy

*SAME :*

**4.5.6** *describe the observable effect of energy (i.e., heating and cooling) on the properties of materials. (MLO 4.3)*

*SAME:*

**4.5.7** *use measurement to verify that the weight of the whole object is always the sum of the weights of all its parts.*

4.5.8 Explain that many changes occur faster under hotter conditions

*Change in wording:*

**4.5.8** *explain how heat speeds physical and chemical reactions.*

# Maryland Science Standards

## 4-5

### 5.0 Physics

#### Mechanics

*SAME:*

**5.5.1** *cite examples of stored energy (e.g. ball held above floor) and energy in a motion (e.g., ball rolling).*

5.5.2 Explain that forces (e.g. Friction) cause specific changes in motion (including speed and direction)

*Change in wording:*

**5.5.2** **explain that forces cause specific changes in motion (including speed and direction).**  
(MLO 5.1)

*SAME:*

**5.5.6** *explain that the force of Earth's gravity pulls any object toward Earth.*

*New Questions:*

**5.5.3** *explain that forces acting on objects cause actions and reactions (e.g. objects falling, rolling, and bouncing).*

**5.5.4** *describe an observed change in the position and motion of objects in terms of starting conditions, type of change, and ending conditions, using words, diagrams, or graphs.*

**5.5.5** **distinguish among different types of motions (e.g. uniform, variable, periodic).**

#### Thermodynamics

*SAME:*

**5.5.7** *describe ways in which heat energy can be produced (e.g., by burning, mixing two materials together, or using electric currents).*

*SAME:*

**5.5.8** *give examples of materials that conduct heat energy better than others.*

5.5.9 Explain that warmer objects can warm a cooler object by contact or at a distance until they reach the same temperature.

*Change in wording:*

**5.5.9** *explain that heat energy moves from a warm object to a cooler object by contact or at a distance until they reach the same temperature.*

### **Electricity and Magnetism**

*SAME:*

**5.5.10** *compare conductors and nonconductors of electricity.*

5.5.11 construct a simple electric circuit that provides a pathway so that energy can move between a source (battery) and an object (bulb) in a complete loop

*Change in wording:*

**5.5.11** *construct a simple electric circuit that provides a pathway so that energy can move between a source (battery) and an object (bulb and/or bell). (MLO 5.2)*

*SAME:*

**5.5.12** *explain that magnets exert a force that attracts or repels other magnets and attracts objects containing iron. (MLO 5.3)*

5.5.13 explain that an electric circuit produces a magnetic effect

*Change in wording:*

**5.5.13** *explain that an electric circuit produces a magnetic effect (i.e., electromagnet).*

### **Wave Interactions**

*SAME:*

**5.5.14** *explain that energy is needed to make objects vibrate.*

*SAME:*

**5.5.15** *explain that sound vibrations are needed for "hearing" to occur.*

*SAME:*

**5.5.16** *explain that light will travel in a straight line until it strikes an object, which may alter the path (e.g., reflection from a mirror, refraction from a lens.)*

*SAME:*

5.5.17 *identify things (e.g., prisms, soap bubbles, oil films) that produce colors from white light.*

## Maryland Science Standards 4-5

### 6.0 Environmental Science

#### Flow of Matter and Energy

6.5.1 explain that regardless of how many parts of a material are assembled or broken apart, the parts are the same total weight as the whole.

*Change in wording:*

**6.5.1** *explain that regardless of how many parts of a material are assembled or broken apart, the parts are the same.*

#### Interdependence of Organisms

*SAME:*

**6.5.2** explain how Earth's surface features (i.e., mountains, valleys, oceans) and environmental conditions (i.e., temperatures, amounts of food or nutrients, types of soil) limit what types of living things can survive. (MLO 6.1)

*SAME:*

**6.5.3** *identify the survival needs and interactions between organisms and the environment (e.g., insects depend on plant and animal material for food).*

#### Natural Resources and Human Needs

6.5.4 explain how natural resources (i.e., renewable and nonrenewable) are used by humans.

*Change in wording:*

**6.5.4** explain how natural resources (i.e., renewable and nonrenewable) are used by humans to meet basic needs. (MLO 6.1)

#### Environmental Issues

*SAME:*

**6.5.5** *explain that decisions influencing the environment may have benefits, drawbacks, and unexpected consequences no matter how carefully the*

*decisions are made.*

# Maryland Science Standards

## 6-8

### 1.0. Skills and Processes

#### Scientific Inquiry

1.8.1 Access and process information in order to formulate questions, which lead to the development of a testable hypothesis.

*New questions:*

**1.8.1 access and process information from readings, investigations, and /or oral communications. (MLO 1.1.1)**

**1.8.2 formulate questions, which lead to the development of a testable hypothesis. (MLO 1.1.2)**

1.8.2 Design and safely conduct investigations in which variables are controlled.

*New questions:*

**1.8.4 recognize/develop well-designed procedures that identify the independent and dependent variables, the need for control when testing a factor, the importance of multiple trials, the selection of appropriate materials/equipment, and the development of clear, logical directions within an investigation. (MLO 1.1.4)**

**1.8.5 demonstrate safety when conducting an investigation.**

1.8.3 Use developmentally appropriate instruments, including computers and their accessories and demonstrate safety when conducting investigations and making measurements.

*New question:*

**1.8.6 use appropriate instruments and metric units when making measurements and collecting data. (MLO 1.1.5)**

1.8.4. Using appropriate instruments including calculators, spreadsheets, and databases and graphing programs, collect organize, and display data to form and support an explanation based on evidence and scientific principles.

*New question:*

**1.8.7 collect, organize, and display data in ways others can verify (i.e. numbers, statistics, tables, graphs, drawings, charts, diagrams) using appropriate instruments (e.g., calculators, spreadsheets, databases, and graphing programs). (MLO 1.1.6)**

1.8.5 Analyze and summarize data to form a logical argument about a cause and effect relationship or sequence of events.

*New question:*

**1.8.8 analyze and summarize data to identify trends and form a logical argument about a cause and effect relationship or a sequence of events. (MLO 1.1.7)**

1.8.6 Interpret and communicate findings through speaking, writing, and drawing using developmentally appropriate methods including technology tools and telecommunications.

*New question:*

**1.8.9 interpret and communicate findings (i.e., *speaking, writing, and drawing*) in a form suited to the purpose and audience, using developmentally appropriate methods including technology tools and telecommunications. (MLO 1.1.8)**

*New Question:*

**1.8.3 use observations, research, and select appropriate scientific information to form predictions and hypotheses. (MLO 1.1.3)**

### **Critical Thinking**

1.8.7 Apply concepts and processes of science to take and defend a position relative to an issue.  
*(Expanded to critical thinking concepts. No directly related question)*

1.8.8 critique scientific information and identify possible sources of bias.  
# change only

**1.8.12 critique scientific information and identify possible sources of bias.**

*New Questions:*

**1.8.10 describe similarities and differences of objects, materials, concepts, and actions. (MLO 1.2.1)**

**1.8.11 construct and use classification systems for grouping objects, materials, concepts, and actions, organisms, etc. (MLO 1.2.2)**

**1.8.13 analyze the adequacy of the supporting evidence used to form conclusions, devise a plan, or solve a practical problem. (MLO 1.2.3)**

**1.8.14 provide supporting evidence when forming conclusions, devising a plan or solving a practical problem. (MLO 1.2.4)**

**1.8.15 analyze and extend patterns. (MLO 1.2.5)**

**1.8.16 modify ideas based on new information from developmentally appropriate readings, data, and the ideas of others. (MLO 1.2.6)**

**1.8.17 describe to others how scientific information was used. (MLO 1.2.7)**

### **Applications of Science**

*New Questions:*

**1.8.18 apply scientific principles and/or concepts to understand a new situation. (MLO 1.3.1)**

- 1.8.20 apply concepts and processes of science to take and defend a position relative to an issue. (MLO 1.3.2)**
- 1.8.21 use the knowledge of science and available scientific equipment to devise a plan to solve a global problem. (MLO 1.3.3)**

### **Technology**

1.8.10 explain that a model has advantages and disadvantages and may need to be changed for different purposes.

*# change only:*

**1.8.22 explain that a model has advantages and disadvantages and may need to be changed for different purposes. (MLO 1.4.1)**

1.8.11 demonstrate and explain that tools are essential to scientific investigation for such purposes as to observe, estimate, measure, compute, collect, and communicate scientific data and information (i.e., size, distance, motion).

*# change only:*

**1.8.23 demonstrate and explain that tools are essential to scientific investigation for such purposes as to observe, estimate, measure, compute, collect, and communicate scientific data and information (i.e., size, distance, motion). (MLO 1.4.2)**

1.8.12 design, plan, and construct things (e.g., instruments, machines, structures, and systems).

*Change in wording:*

***1.8.24 design, plan, and construct things in response to a particular need or problem (e.g., instruments, machines, structures, and systems).***

1.8.13 evaluate and modify designs and products, when demonstrating that a solution to one problem can result in other problems and taking into account various constraints (e.g., gravity, property of materials, economic, political, social, ethical, and aesthetic issues).

*# change only:*

***1.8.25 evaluate and modify designs and products, when demonstrating that a solution to one problem can result in other problems and taking into account various constraints (e.g., gravity, property of materials, economic, political, social, ethical, and aesthetic issues).***

1.8.14 explain that science and technology have strongly influenced life under different technological circumstances in the past and continue to do so today.

*# change only:*

***1.8.26 explain that science and technology have strongly influenced life under different technological circumstances in the past and continue to do so today.***

**History of Science**

1.8.15 Explain how people from different cultures and times have made important contributions to the advancement of science, mathematics, and technology in different cultures and different times.

*# change only:*

***1.8.27 explain how people from different cultures and times have made important contributions to the advancement of science, mathematics, and technology in different cultures at different times.***

1.8.16 explain that scientists are employed in various fields that are located in diverse places ranging from laboratories to natural field settings and their findings become available to everyone in the world.

*# change only:*

***1.8.28 explain that scientists are employed in various fields that are located in diverse places ranging from laboratories to natural field settings and their findings become available to everyone in the world. +***

# Maryland Science Standards

## 6-8

### 2.0. Earth / Space

#### Materials that Shape A Planet

*SAME:*

- 2.8.1** explain that some changes in a planet's surface are due to slow processes (i.e., erosion, weathering) and some changes are due to rapid processes (i.e., landslides, tornadoes, hurricanes, volcanic eruptions, earthquakes, flooding, and tsunamis). (MLO 2.1)

#### Earth History

*SAME: (Different Category)*

- 2.8.2** *analyze the arrangement and size of minerals contained within rocks in order to describe the environmental conditions present during formation.*

*SAME: (Different Category)*

- 2.8.3** *describe how temperature, pressure, and dissolved minerals cause the formation of rocks.*

*SAME: (Different Category)*

- 2.8.4** *explain the physical processes that produce renewable and nonrenewable natural resources (e.g., fertile soils, fossils, fuels, and timber)*

- 2.8.4** (Doubled) explain that fossils and layers of sedimentary rock provide evidence (E.g., relative age) of Earth's biologic and geologic history.

*Change in wording:*

- 2.8.5** **explain that fossils and layers of sedimentary rock provide evidence of Earth's biologic and geologic history including how life and environmental conditions have changed. (MLO 2.2)**

## **Plate Tectonics**

2.8.5 Explain how Earth's crustal plates are influenced by activity in the mantle and core to produce major geologic events (i.e., mountain building, earthquakes, volcanic eruptions, ocean basin formation, sea-floor spreading, and sub-duction).

*# change only*

**2.8.6 explain how Earth's crustal plates are influenced by activity in the mantle and core to produce major geologic events (i.e., mountain building, earthquakes, volcanic eruptions, ocean basin formation, sea-floor spreading, and sub-duction). (MLO 2.3)**

## **Astronomy**

2.8.6 Explain that there are billions and billions of galaxies and each galaxy contains billions of stars that cannot be distinguished by the naked eye because of their great distance from earth.

*# change only:*

**2.8.7 *explain that there are billions and billions of galaxies and each galaxy contains billions of stars that cannot be distinguished by the naked eye because of their great distance from earth.***

2.8.7 Compare and classify celestial objects (i.e., stars, planets, moons, asteroids, comets, and meteors) according to sizes, compositions, and surface features.

*# change only:*

**2.8.8 *compare and classify celestial objects (i.e., stars, planets, moons, asteroids, comets, and meteors) according to sizes, compositions, and surface features.***

2.8.8 Explain that the motion of most objects in the solar system is regular and predictable and explains phenomena (i.e., day, year, phases of the moon, tides eclipses).

*# change only:*

**2.8.9 explain that the motion of most objects in the solar system is regular and predictable and explains phenomena (i.e., day, year, phases of the moon, tides eclipses). (MLO 2.4)**

2.8.9 Demonstrate and explain the causes of the seasons. (I.e. tilt, orbit, latitude, sun's energy).

*Change in wording:*

**2.8.10 demonstrate and explain the causes of the seasons, relative lengths of days and nights, and flow of energy to and from the Earth (i.e., tilt, orbit, latitude, sun's energy). (MLO 2.5)**

2.8.10 Analyze the phenomenon of tides as related to the concept of gravity.

*Change in wording:*

**2.8.11 explain the phenomenon of tides as related to the concept of gravity. (MLO 2.6).**

### **Interactions of the Hydrosphere and Atmosphere**

2.8.11 Explain how climate is affected by ocean currents, Earth's surface features, latitude, and the atmosphere (i.e. volcanic eruptions, El Nino, fluctuations in the jet stream).

*# change only:*

**2.8.12 explain how climate is affected by ocean currents, Earth's surface features, latitude, and the atmosphere (i.e. volcanic eruptions, El Nino, fluctuations in the jet stream).**

2.8.12 Analyze Earth (i.e., land and water) data collected from space-based instruments and relate it to weather patterns.

*# change only:*

**2.8.13 analyze Earth (i.e., land and water) data collected from space-based instruments and relate it to weather patterns.**

### ***New questions:***

**2.8.14 describe and model large-scale and local weather systems.**

**2.8.15 describe the distribution and circulation of the world's water through ocean currents, glaciers rivers, ground water, and atmosphere.**

**2.8.16 describe the composition, properties, and structure of the atmosphere.**

# Maryland Science Standards

## 6-8

### 3.0 Life Science

#### Cellular

3.8.1 cite evidence to explain that living organisms, including humans, are composed of cells (single-celled to multi-cellular) of which details can usually be seen through a microscope (i.e., cell walls, membranes, nucleus, chloroplasts, chromosomes, mitochondria).

*SAME:*

**3.8.1 cite evidence to explain that living organisms, including humans, are composed of cells (single-celled to multi-cellular) of which details can usually be seen through a microscope (i.e., cell walls, membranes, nucleus, chloroplasts, chromosomes, mitochondria). (MLO 3.1)**

3.8.2 Analyze the structure and function of cells, tissues, organs, and systems, and their interrelated nature in living organisms including the human body.

*Change in wording:*

**3.8.2 analyze the structure and function of cells, tissues, organs, and systems, and their interactions in living organisms including the human body. (MLO 3.2)**

3.8.3 Analyze factors that promote or disrupt the structure and function of living organisms. (i.e., diseases, deficiencies, toxins, and other substances)

*Change in wording:*

**3.8.3 analyze concepts (i.e., diseases, deficiencies, toxins, and other factors) that promote or disrupt the structure and function of living organisms. (MLO 3.3)**

#### Genetics

3.8.4 use evidence to support the idea that through reproduction (sexual and asexual), genetic traits are passed from one generation to the next (e.g. selective breeding).

*Change in wording:*

**3.8.4 use evidence to support the idea that through reproduction (sexual and asexual i.e., cuttings, selective breeding), genetic traits are passed from one generation to the next. (MLO 3.4)**

## Evolution

3.8.6 Analyze the changes that occur in species of organisms as a result of the changes in Earth's physical environment over time.

*Change in wording:*

**3.8.6 analyze the changes that occur (e.g. adaptations of plants and animals) in species of organisms as a result of the changes in Earth's physical environment over time.**

*New Question:*

**3.8.7. analyze factors that influence the size and stability of populations.**

## Biochemistry

3.8.8 Explain that food, water, and air provide substances that serve as building materials and supply energy for all organisms. (MLO 3)

*Change in wording:*

**3.8.8 explain that food, water, and air provide molecules that serve as building materials and supply energy for all organisms. (MLO 3)**

3.8.10 Explain that energy entering the ecosystem as sunlight is transferred by producers into chemical energy through photosynthesis.

*Change in wording:*

**3.8.10 explain that energy entering the ecosystem as sunlight is transferred by producers into chemical energy through photosynthesis.**

3.8.11 Explain how consumers in a food chain depend on the chemical energy provided by producers for survival.

**(No question in new document)**

## Ecology

*SAME:*

**3.8.12 analyze evidence that within ecosystems organisms have different functions (niches) that enable the ecosystem to survive.**

*SAME:*

**3.8.13 analyze changes that occur due to interactions in the environment and determine if they are beneficial or detrimental from different perspectives (e.g., producer/consumer, predator/prey, or parasite/host).**

# Maryland Science Standards

## 6-8

### 4.0 Chemistry

#### Structure of Matter

*SAME:*

**4.8.1** distinguish one substance from another based on observable and measurable properties (i.e., density, boiling point, melting point). (MLO 4.1)

*SAME:*

**4.8.2** describe the development of the atomic theory from Democritus to Bohr (Grade 8 only).

#### Physical or Chemical Changes

*SAME:*

**4.8.3** distinguish between chemical and physical changes based on observable properties. (MLO 4.2)

#### Classification of Matter

*SAME (but different category):*

**4.8.4** describe that elements combine in whole number ratios to form other substances called compounds (e.g.,  $H_2O$ ,  $CO_2$ ,  $CO$ ).

**4.8.5** Use groupings (i.e. elements and compounds) based on observable properties (i.e., metallic and non-metallic, reactive and non-reactive).

*Change in wording:*

**4.8.5** use groupings (i.e., simple periodic table, metals/non-metals, reactive/non-reactive) of matter to predict reactions. (MLO 4.3)

### Conservation of Energy and Matter

4.8.6 Explain that energy cannot be created or destroyed but instead can be changed from one form into another.

*Change in wording:*

**4.8.6 explain that matter and energy cannot be created or destroyed but instead can be changed from one form into another. (MLO 4.4)**

*SAME:*

**4.8.7 distinguish between mass and weight.**

*SAME:*

**4.8.8 explain that atoms and molecules are in constant motion and that an increase in temperature will increase that motion.**

## Maryland Science Standards 6-8

### 5.0 Physics

#### Mechanics

*SAME:*

**5.8.1 explain that matter and energy cannot be created or destroyed but instead can be changed from one form into another.**

*SAME:*

**5.8.2 Apply Newton's Laws of Motion (inertia,  $F=ma$ , action/reaction) to everyday situations.**

*SAME:*

**5.8.3 distinguish between mass and weight.**

*SAME:*

**5.8.6 explain that every object exerts gravitational force on every other object. (MLO 5.3)**

*New Questions:*

- 5.8.4 *measure and describe characteristics (i.e., speed, distance, mass, force) of moving objects and their interactions (i.e., force, velocity, acceleration, potential energy, kinetic energy) within a system.*
- 5.8.5 *explain the fundamental concepts that underlie motions and forces and the relationships among them (e.g. inertia,  $F=ma$ , action/reaction, equilibrium).*

### Thermodynamics

*SAME:*

- 5.8.7 **explain that heat energy is a product of energy transformations (i.e., a runner, simple machines, complex machines).**  
(MLO 5.4)

*SAME:*

- 5.8.8 *explain that heat energy can be transferred through materials by conduction, convection and radiation.*

*SAME:*

- 5.8.9 *explain how energy moves from warmer objects to cooler ones until equilibrium is reached.*

### Electricity and Magnetism

*SAME:*

- 5.8.10 **identify and describe how various types of electric circuits (i.e., series and parallel) provide a means of transferring and using electrical energy to produce heat, light, sound, as well as chemical changes. (MLO 5.5).**

*SAME:*

- 5.8.12 **explain that the strength of the magnetic force depends on the distance between the magnets and the object.**

*SAME:*

- 5.8.13 **describe the magnetic effects of current (i.e., electromagnet) and the electric effects of magnets (i.e., motors). (MLO 5.6)**

*New Question:*

- 5.8.11 *compare different ways of obtaining, transforming, and distributing energy from various sources (e.g. fossil fuels, sun, water, radioisotopes) and their impact on the environment.*

### Wave Interactions

*SAME:*

**5.8.14** describe behaviors (i.e., reflection, refraction and absorption) and properties (i.e., wave length, frequency, amplitude, velocity) of different kinds of waves. (MLO 5.7)

*SAME:*

**5.8.16** *explain that for an object to be "seen," light reflected or emitted by an object must enter the eye.*

*SAME:*

**5.8.17** *explain that white light is a mixture of many different colors and that colored light is a mixture of some of these colors.*

*SAME:*

**5.8.18** *explain how the interaction of white light with an object produces the perceived color of the object.*

### **Nuclear Energy**

*SAME:*

**5.8.19** *identify that nuclear fission and fusion are alternate forms of energy.*

## **Maryland Science Standards**

### **6-8**

## **6.0 Environmental Science**

### **Flow of Matter and Energy**

*SAME:*

**6.8.1** *explain how matter is transformed between the physical environment and organisms (e.g. food webs, nitrogen cycle) and that the total amount of matter remains constant.*

### **Interdependence of Organisms**

*SAME:*

**6.8.2** **identify and explain the interdependency of organisms within the environment in a given ecosystem (i.e., producer/consumer, predator/prey, host/parasite).** (MLO 6.1)

## Natural Resources and Human Needs

*SAME:*

**6.8.4** *compare how different parts of the world have varying amounts and types of natural resources and how the use of those resources determines environmental quality (i.e. soil erosion, water pollution, deforestation).*

## Environmental Issues

6.8.5 analyze how human activities can induce hazards and accelerate or magnify many naturally occurring changes (i.e., erosion, air and water quality, population).

*Change in wording:*

**6.8.5** **analyze how human activities can accelerate or magnify many naturally occurring changes (i.e., erosion, air and water quality, populations). (MLO 6.2)**

**6.8.6** *compare different ways of obtaining, transforming, and distributing energy from various sources (e.g., fossil f*

*SAME: uels, sun, water, radioisotopes) and their impact on the environment.*

# Maryland Science Standards

## 9-12

### 1.0. Skills and Processes

#### Scientific Inquiry

1.2.1 Access and process information in order to formulate questions that lead to a testable hypothesis, which demonstrates the logical connections between the scientific concepts and design of an investigation.

*New Questions:*

**1.12.1 access and process information from readings, investigations, and/or oral communications. (SFS 3.2)(SFS 4.1)**

**A. The student will read a technical selection and interpret it appropriately. (CLG 1.5.6)**

*B. The student will learn the use of new instruments and equipment by following instructions in a manual or from oral direction. (CLG 1.3.4)*

**C. The student will use relationships discovered in the lab to explain phenomena observed outside the laboratory. (CLG 1.2.7)**

**D. The student will create and/or interpret graphics (scale drawings, photographs, digital images, etc. (CLG 1.5.4)**

**1.12.2 formulate questions that lead to a testable hypothesis, which demonstrates the logical connections between the scientific concepts and the design of an investigation.**

**A. The student will identify meaningful, answerable scientific questions.(CLG 1.2.1)**

*B. The student will pose meaningful, answerable, scientific questions. (CLG 1.2.2)*

**1.12.3 use observations, research, and select appropriate scientific information to form predictions and hypotheses.**

**A. The student will formulate a working hypothesis. (CLG 1.2.3)**

1.12.2 Design and safely implement experimental approaches, which answer scientific questions.

*New Questions:*

**1.12.4 design experimental approaches, which answer scientific questions.**

**A. The student will select appropriate instruments and materials to conduct an investigation. (CLG 1.2.5)**

**B. The student will identify appropriate methods for conducting an investigation and affirm the need for proper controls in an experiment. (CLG 1.2.6)**

**1.12.5 demonstrate safety when conducting an investigation.**

**A. The student will recognize safe laboratory procedures. (CLG 1.3.2)**

**B. The student will demonstrate safe handling of the chemicals and materials of science. (CLG 1.3.3)**

1.12.3 Select and correctly use appropriate instrumentation including computers and their accessories and demonstrate safety when conducting investigations.

*AND*

1.12.4 Using appropriate instruments, including calculators, spreadsheets, and databases and graphing programs, formulate and support an explanation or model (physical, conceptual, or mathematical).

*New Questions:*

**1.12.6 use mathematical processes (measuring, calculating, etc.) when conducting investigations, analyzing information, and/or displaying information.**

**A. The student will recognize mathematics as part of the scientific endeavor, comprehend the nature of mathematical thinking, and become familiar with key mathematical ideas and skills. (CLG 4.6.2)**

**B. The student will recognize the important role that mathematics serves when solving problems in physics. (CLG 5.7.2)**

**C. The student will recognize mathematics as an integral part of the scientific process. (CLG 1.7.4)**

**D. The student will use ratio and proportion in appropriate situations to solve problems. (CLG 1.6.1)**

**E. The student will use computers and/or graphing calculators to perform calculations for tables, graphs, or spreadsheets. (CLG 1.6.2)**

**F. The student will express and/or compare small and large quantities using scientific notation and relative order of magnitude. (CLG 1.6.3)**

**G. The student will manipulate quantities and/or numerical values in**

*algebraic equations. (CLG 1.6.4)*

**H. The student will judge the reason-ableness of an answer. (CLG 1.6.5)**

**1.12.7 collect, organize, and display data in multiple ways that fit the context using appropriate instruments to effectively convey the information (e.g., calculators, spreadsheets, and databases and graphing programs). (SFS 3.2) (SFS 4.1)**

**A. The student will test a working hypothesis. (CLG 1.2.4)**

**B. The student will develop and demonstrate skills in using lab and field equipment to perform investigative techniques. (CLG 1.3.1)**

**C. The student will organize data appropriately using techniques such as tables, graphs, and webs (for graphs: axes labeled with appropriate quantities, appropriate units on axes, axes labeled with appropriate intervals, independent and dependent variables on correct axes, appropriate title. (CLG 1.4.1)**

**D. The student will use computers and/or graphing calculators to produce tables, graphs, and spreadsheet calculations. (CLG 1.5.5)**

1.12.5 Analyze appropriate data in forming conclusion and apply what has been learned to evaluate the hypothesis.

*New Questions:*

**1.12.8 analyze appropriate data to identify trends to form conclusions and apply what has been learned to evaluate the hypothesis.**

**A. The student will analyze data to make predictions, decisions, or form conclusions. (CLG 1.4.2)**

**B. The student will use experimental data from various investigators to validate results. (CLG 1.4.3)**

**C. The student will determine the relationships between quantities and develop the mathematical model that describes these relationships. (CLG 1.4.4)**

**D. The student will check graphs to determine that they do not misrepresent results. (CLG 1.4.5)**

**E. The student will describe trends revealed by data. (CLG 1.4.6)**

**F. The student will use analyzed data to confirm, modify, or reject an hypothesis. (CLG 1.4.9)**

1.12.6 Interpret and communicate findings through speaking, writing, and drawing using developmentally appropriate methods including technology tools and telecommunications.

*New Questions:*

**1.12.9 interpret and communicate findings through speaking, writing, and drawing in a form suited to the purpose and audience, in a form suited to the purpose and audience, using developmentally appropriate methods including technology tools and telecommunications. (SFS 3.1) (SFS 4.1)**

**A. The student will demonstrate the ability to summarize data (measurements/observations). (CLG 1.5.1)**

**B. The student will explain scientific concepts and processes through drawing, writing, and/or oral communication. (CLG 1.5.2)**

**C. The student will use tables, charts, and graphs to display data in making arguments and claims in both oral and written presentations. (CLG 2.8.3), (CLG 5.6.4)**

***D. The student will use computers and/or graphing calculators to produce the visual materials (tables, graphs, and spreadsheets) that will be used for communicating results. (CLG 1.5.3)***

**E. The student will communicate conclusions derived through a synthesis of ideas. (CLG 1.5.9)**

1.12.7 Defend a position on a scientific issue and take into account the different types of risks and benefits in formulating a plan of action.

*New Question:*

**1.12.10 Analyze similarities and differences of objects, materials, concepts, and actions.**

**A. The student will describe similarities and differences when explaining concepts and/or principles. (CLG 1.5.8)**

***NEW QUESTION:***

**1.12.11 construct various classification systems and infer degree of divergence and/or kinship of various objects, materials, concepts, actions, and organisms.**

**A. The student will use, explain, and/or construct various classification**

**systems. (CLG 1.5.7)**

1.12.8 Critique scientific information in order to detect bias and analyze the source of the bias.

*Change in wording / Expansion:*

**1.12.12 critique scientific information in order to detect bias and analyze the source of the bias. (SFS 2.2)**

**A. The student will critique arguments that are based on faulty, misleading data or on the incomplete use of numbers. (CLG 1.1.3)**

**B. The student will recognize data that are biased. (CLG 1.1.4), (CLG 2.8.2), (CLG 5.6.2)**

**C. The student will explain the factors that produce biased data. (CLG 1.1.5)**

1.12.13 analyze the adequacy of the supporting evidence used to form conclusions, devise a plan, or solve a practical problem. (SFS 2.2)

The student will determine the sources of error that limits the accuracy or precision of experimental results.

(CLG 1.4.7)

1.12.14 provide supporting evidence when forming conclusions, devising a plan or solving a practical problem.

(SFS 2.2)

The student will defend the need for verifiable data. (CLG 1.2.8)

*1.12.15 analyze and extend patterns.*

1.12.16 analyze conclusions and modify ideas based on new information from developmentally appropriate readings, data, and the ideas of others.

The student will modify or affirm scientific ideas according to accumulated evidence.

(CLG 1.1.2)

1.12.17 describe to others how scientific information was used.

1.12.18 apply scientific principles and/or concepts to understand a new situation.

1.12.19 The student will apply skills, processes, and concepts of biology, chemistry, physics, and earth/space science to societal issues.

(CLG 1.7.1)

*The student will describe the role of science in the development of literature, art, and*

*music.(CLG 1.7.3)*

*The student will apply chemistry to the concepts of biology, earth/space science, and environmental science. (CLG 4.6.1)*

*The student will apply physics to the concepts of biology, earth/space science, and environmental science.  
(CLG 5.7.1)*

*The student will investigate the role of chemistry in areas of human endeavor and achievement.  
(CLG 4.6.3)*

*The student will investigate the role of physics in all areas of human endeavor and achievement  
(CLG 5.7.3)*

- 1.12.20 defend a position on a scientific issue and take into account the different types of risks and benefits in formulating a plan of action.(SFS 2.3)

*The student will investigate an issue such as climatic changes or electric power generation.  
(CLG 2.8.1)*

*The student will investigate a social issue related to physics such as alternate energy source, fiber optics in telecommunications, nuclear power, microwave technology, effect of power lines, etc.  
(CLG 5.6.1)*

- 1.12.21 The student will recognize that real problems have more than one solution and decisions to accept one solution over another are made on the basis on many issues.  
(CLG 1.1.1),(CLG 2.8.5),  
(CLG 5.6.3) (SFS 2.3)

The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.  
(CLG 2.8.4)

- 1.12.22 *design, construct, and use **models** (e.g., math, computer, physical) to make **predictions** about actual events.*

*The student will use models and computer simulations to extend his/her understanding of scientific Concepts.(CLG 1.4.8)*

- 1.12.23 demonstrate and explain how using existing tools extend knowledge and identify the limitations, which drive the need for new technologies (i.e., create improvements in observing, estimating, measuring, computing, collecting, and communicating

scientific data and information).

The student will explain how development of scientific knowledge leads to the creation of new technology and how technological advances allow for additional scientific accomplishments.

(CLG 1.7.6)

- 1.12.24 *explain that when designing a device. Process, or system (e.g., manufacturing, marketing, operating, maintaining, replacing, and disposing of) risk analysis and technology assessment determines how it will be employed.*
- 1.12.26 explain that science and technology have strongly influenced the course of history and cite how human inventiveness has brought new risks as well as improvements to human existence. The student will identify and evaluate the impact of scientific ideas and/or advancements in technology on society.(CLG 1.7.2)
- 1.12.27 *describe how various cultures from ancient times to the present have made contributions that led to current scientific ideas and technological invention.*
- 1.12.28 *explain that scientific careers differ from one another in what is studied, techniques used, where studied, and outcomes sought but they share a common purpose and philosophy and are part of the same scientific enterprise. The student will investigate career possibilities in the various areas of science.(CLG 1.7.5)*

2.0

2.12.1 explain how the formation, **weathering, sedimentation**, and reformation of rock constitutes a continuing "**rock cycle**" in which the total amount of materials stay, the same.

The student will describe current efforts and technologies used to study the atmosphere, land, and oceans of Earth (remote sensing from space, undersea exploration, seismology, weather data collection).

(CLG 2.1.1)

The student will identify common rock forming mineral groups using a key and the properties of Minerals (hardness, luster, specific gravity, streak, color, cleavage). (CLG 2.4.2)

The student will use texture and composition to describe various types of rocks (igneous, sedimentary, metamorphic). (CLG 2.4.3)

The student will apply the law of conservation to the processes that affect rocks and minerals (metamorphism, weathering, erosion, deposition, melting, crystallization). (CLG

2.4.4)

The student will explain the dynamic activity of the earth (plate tectonics, sea floor spreading, faulting, earthquakes, volcanoes). CLG (2.4.5)

The student will explain the role of natural forces on Earth (retention of an atmosphere, an agent of erosion and deposition, tides and deep ocean currents). (CLG 2.2.2)

The student will interpret the effects of natural cycles on human activity (weathering, erosion and deposition, agriculture, aquaculture). (CLG 2.5.2)

2.12.5 use **absolute dating, superposition, and fossil correlation** to explain the sequence of events, which make up Earth's **biologic** and **geologic** history.

The student will research the change in belief in the age of the earth (fossil record, rock layers, radioactive dating, Big Bang theory). (CLG 2.6.2)

The student will create a geologic time scale including eras, periods, and epochs (analogies, ratios, scale drawings, powers of ten). (CLG 2.7.1)

The student will construct a model to show human's place in the time continuum. (CLG 2.7.2)

2.12.6 describe Earth's surface in reference to **plate tectonics** (i.e., internal heat flow and the dynamic nature of Earth's **crust**).

The student will describe the structure of Earth (inner core, outer core, mantle, lithosphere – crust and upper mantle). (CLG 2.4.1)

2.12.7 identify and describe the properties, interactions, and the theories of formation of the universe and its components (i.e., galaxies, stars, **planets, asteroids, comets**, and meteors).

The student will describe current efforts and technologies used to study the universe (optical telescopes, radio telescopes, spectroscopes, satellites, space probes, manned missions). (CLG 2.1.2)

The student will explain the role of natural forces in the universe (formation of planets, orbital mechanics, stellar evolution). (CLG 2.2.1)

The student will research the various planetary models (Ptolemy, Copernicus, Kepler, Galileo). (CLG 2.6.1)

The student will investigate various physical cycles found in the natural world (rock cycle, water cycle, tides, lunar phases, eclipses, seasons). (CLG 2.5.1)

The student will demonstrate the relative sizes and distances of planets in the solar system. (CLG 2.7.3)

2.12.8 *compare the similarities and differences among the sun, the terrestrial planets, and the gas planets and relate those similarities and differences to the structure, scale, and formation of the solar system.*

2.12.12 analyze the major components of the **atmosphere** and **hydrosphere** and explain how the transfer of **energy** through them influences Earth's **weather** and **climate**.

The student will describe heat transfer systems affecting the atmosphere, land, and oceans (convection, conduction, radiation from space and from within Earth). (CLG 2.3.1)

The student will investigate meteorological phenomena (hurricanes, tornadoes, floods, thunderstorms, blizzards). (CLG 2.3.2)

The student will research topics of current concern with regard to

Climate (greenhouse effect, global warming [or cooling], ocean currents). (CLG 2.3.3)

The student will investigate various physical cycles found in the natural world (rock cycle, water cycle, tides, lunar phases, eclipses, seasons). (CLG 2.5.1)

2.12.15 *explain the principles of hydrology including surface and ground water flows, aquifers, percolation, desalinization and sources of water contamination and pollution*

2.12.16 *analyze the major components, thermal structure and chemical composition of the atmosphere.*

The student will describe heat transfer systems affecting the atmosphere, land, and oceans (convection, conduction, and radiation) from space and from within Earth. (CLG 2.3.1)

*The student will describe changes in atmospheric conditions over time and explain possible causes including the greenhouse effect and ice age cycles.*

*The student will relate the dramatic changes in the composition of the Earth's atmosphere (introduction of oxygen) to the presence of single-celled life forms*

### 3.0

3.12.1 explain that most life functions involve chemical reactions regulated by information stored within the cell and may be influenced by the cell's response to its **environment**.

The student will be able to describe the unique characteristics of chemical compounds and macromolecules utilized by living systems (water, carbohydrates, lipids, proteins, nucleic acids, minerals, vitamins).

(CLG 3.1.1)

The student will be able to discuss factors involved in the regulation of chemical activity as part of a homeostatic mechanism (osmosis, temperature, pH, enzyme regulation). (CLG 3.1.2)

The student will describe the flow of matter and energy between living systems and the physical environment (water cycle, carbon cycle, nitrogen cycle, photosynthesis, cellular respiration, chemosynthesis).

(CLG 3.1.3)

The student will explain the function of structures found in cellular and multicellular organisms (transportation of materials, waste disposal, movement, feedback, asexual and sexual reproduction, control of structures, capture and release of energy, protein synthesis).

(CLG 3.2.1)

The student will conclude that cells exist within a narrow range of environmental conditions and changes to that environment, either naturally occurring or induced, may cause death of the cell or organism (pH, temperature, light, water, oxygen, carbon dioxide, radiation, toxins).

(CLG 3.2.2)

3.12.3 *describe the abnormal functioning in cell regulation, such as cancer, as it relates to cell growth, division, and response to environment.*

3.12.4 explain how **traits** are **inherited** and passed from one generation to the next (i.e., from parental DNA, RNA to gross **anatomical** traits of offspring).

The student will demonstrate that the sorting and recombination of genes during sexual reproduction has an effect on variation in offspring (meiosis, fertilization).

(CLG 3.3.1)

The student will illustrate and explain how expressed traits are passed from parent to

offspring (phenotypes, dominant and recessive traits, sex-linked traits, genotypes, punnett square).

(CLG 3.3.2)

The student will explain how a genetic trait is determined by the code in a DNA molecule (definition of gene, structure of DNA, sequence of bases directing protein formation, proteins).

(CLG 3.3.3)

The student will describe the effect of gene alteration on an organism and/or a population (mutations, chromosome number, cloning, genetic recombination).

(CLG 3.3.4)

3.12.6 analyze the mechanisms of evolutionary changes (i.e., genetic variation, environmental changes, and natural selection).

The student will explain how new traits may result from new combinations of existing genes or from mutations of genes in reproductive cells within a population (natural selection, adaptations, variation).

(CLG 3.4.1)

The student will estimate degrees of kinship among organisms or Species (classification, anatomical similarities, similarities of DNA base and/or amino acid sequence).

(CLG 3.4.2)

3.12.8 explain the correlation between the structure and function of biologically important **molecules** and their relationships to life processes.

The student will be able to describe the unique characteristics of chemical compounds and macromolecules utilized by living systems (water, carbohydrates, lipids, proteins, nucleic acids, minerals, vitamins).

(CLG 3.1.1)

The student will be able to discuss factors involved in the regulation of chemical activity as part of a homeostatic mechanism (osmosis, temperature, pH, enzyme regulation).

(CLG 3.1.2)

The student will analyze the relationships among organisms and between organisms and abiotic factors (abiotic/boitic factors: space, soil, water, air, temperature, food, light, organisms; relationships: predator – prey, parasite – host, mutualism, commensalism).

(CLG 3.5.1)

3.12.12 analyze the **interdependence** of diverse living **organisms** and their interactions with the components of the **biosphere**.

The student will analyze the interrelationships and interdependencies among different organisms and explain how these relationships contribute to the stability of the ecosystem (diversity, succession, niche). (CLG 3.5.2)

The student will investigate how natural and man-made changes in environmental conditions will affect individual organisms and the dynamics of populations (depletion of food, destruction of habitats, disease, natural disasters, pollution, population increase, urbanization). (CLG 3.5.3)

The student will illustrate how all organisms are part of and depend on two major global food webs (oceanic food web, terrestrial food web). (CLG 3.5.4)

The student will analyze the consequences and/or trade-offs between technological changes and their effect on the individual, society and the environment. They may select topics such as bioethics, genetic engineering, endangered species, and food supply. (CLG 3.6.1)

*3.12.13 analyze the consequences of extinction and introduction of exotic species within ecosystems.*

4.0

4.12.1 use observation of the properties of **matter** to predict its structure and changes to its structure.

The student will select and use appropriate devices to measure directly or indirectly the length, mass, volume, or temperature of a substance (centigram balances, graduated cylinders & pipettes, metric rulers, thermometers & temperature probes). (CLG 4.1.1)

The student will gather and interpret data related to physical and chemical properties of matter such as density and percent composition (constructing data tables, graphing linear relationship, appropriate technology to analyze data). (CLG 4.1.2)

The student will distinguish among metallic, ionic, and covalent solids in terms of observable properties (solubility, melting point, boiling point, conductivity). (CLG 4.2.4)

The student will illustrate the structure of the atom and describe the characteristics of the particles found there (protons, neutrons, & electrons; nucleus). (CLG 4.2.1)

4.12.3 explain how the number and arrangement of **electrons** can be used to predict when an **atom** will transfer or share electrons to form a bond and explain how the resulting materials are different from the original materials (i.e., organic, biochemical, and inorganic examples).

The student will demonstrate that the arrangement and number of electrons determine the properties of an element and that these properties repeat in a periodic manner illustrated by their arrangement in the periodic Table (atomic number, mass number, valence electrons, chemical properties/families). (CLG 4.2.2)

The student will explain how atoms interact with other atoms through the transfer and sharing of electrons in the formation of chemical bonds characteristics of a neutral atom, formation of ions, ionic bonding, covalent bonding). (CLG 4.2.3)

The student will summarize that the properties of a molecule are determined by the number and types of atoms it contains and how they are arranged (determine the types and numbers of atoms represented by a given formula, polar and nonpolar molecules). (CLG 4.2.5)

The student will explain why organic compounds have such diverse properties and give examples of how they have had an impact on society (unique characteristics of carbon, fuels and plastics).  
(CLG 4.2.6)

The student will illustrate that substances can be represented by formulas (know that symbols are used to represent elements; identify the atomic mass of the element; write formulas for compounds given the name of the compound; name binary compounds given the formula; calculate the molecular weight of a compound given the periodic table). (CLG 4.4.1)

The student will show that chemical reactions can be represented by symbolic or word equations that specify all reactants and products involved (CLG 4.4.2)

The student will use the law of conservation of mass and energy to balance simple equations (use appropriate coefficients to balance a given symbolic equation). (CLG 4.4.3)

The student will classify chemical reactions into general types based on the nature of the observed changes synthesis and decomposition, combustion, single and double displacement).  
(CLG 4.4.4)

The student will demonstrate that adjusting quantities of reactants will affect the amounts of products

Formed (use the coefficients of a balance a given symbolic equation). (CLG 4.4.5)

The student will describe a neutralization reaction (properties of acids and bases, characteristics of weak and strong acids and bases, characteristics of salts, indicators, pH scale). (CLG 4.4.6)

- 4.12.5 explain that all matter has structure and the structure serves as the basis for the properties of and the changes in matter.

The student will demonstrate how matter may be identified and classified in various ways based upon common properties (states of matter; elements, compounds, mixtures, solutions; metals/nonmetals). (CLG 4.1.3)

- 4.12.6 analyze the interrelationship of **mass** and energy associated with chemical, physical, and **nuclear changes**. (i.e., endothermic, exothermic, kinetic molecular theory, rate of change, and **gas** laws)

The student will illustrate that heat energy in a material consists of the ordered and disordered motions of its colliding particles (phase changes). (CLG 4.3.1)

The student will explain why the interactions among particles involve a change in the energy system (exothermic change, endothermic change, specific heat). (CLG 4.3.2)

The student will conclude that the conservation of mass and energy holds true for all systems, and that the total amount of energy in any closed system remains constant (total amount of energy in any closed system remains constant). (CLG 4.3.3)

The student will describe the observed changes in pressure, volume, or temperature of a sample of gas in terms of the behavior of particles (matter is made of small particles; particles are in constant motion; the collisions among particles are elastic collisions). (CLG 4.3.4)

## 5.0

- 5.12.1 use algebra and geometry to apply the concepts of energy, **force** (i.e., **Newton's Law**, gravitation, friction), and momentum to explain the behavior of objects (i.e., linear and rotational **motion**, projectiles, collisions).

The student will use analytical techniques appropriate to the study of physics (symbolically representing vector quantities, using signs to represent directions, selecting and using appropriate equipment for measuring and investigating, using appropriate units and applying

dimensional analysis, manipulating equations). (CLG 5.1.1)

The student will use algebraic and geometric concepts to describe an object's motion (direction, position, distance/displacement, speed/velocity, motion with a constant acceleration, one and two dimensional motion, frames of reference). (CLG 5.1.2)

The student will analyze and explain how changes in an object's motion are described by Newton's Laws (balanced/unbalanced forces, inertia, acceleration, force, and mass, action/reaction). (CLG 5.1.3)

The student will analyze the behavior of forces (recognize the four forces of nature, comparison of relative magnitude, inverse square nature of gravitational and electromagnetic forces, relation to work and energy). (CLG 5.1.4)

The student will analyze systems with regard to the conservation laws of momentum and energy. (CLG 4.1.5)

5.12.2 *explain the relationship between the universal law of gravitation and the force of gravity on an object at the surface of the Earth.*

5.12.7 analyze and apply the concepts of thermodynamics (i.e., laws, **heat energy** transfer, equilibrium).

The student will relate thermodynamics to the balance of energy in a system (heat transfer, thermal equilibrium, entropy). (CLG 5.3.1)

5.12.10 analyze **electric fields** and their effect on charges and **electric circuits** (i.e., **series**, **parallel**, and complex), magnets and **magnetic fields**, and explain how electricity and **magnetism** affect one another (i.e., motors and generators).

The student will describe the types of electric charges and the forces that exist between them (magnitude, sign, Coulomb's Law). (CLG 5.2.1)

The student will describe the Sources and effects of electric and magnetic fields (static charge, moving charges, simple circuits, permanent magnets). (CLG 5.2.2)

The student will describe how different kinds of materials respond to electric and magnetic fields (conductors, insulators, semiconductors, magnetic materials). (CLG 5.2.3)

The student will explain the principle of electromagnetic induction and its applications (motors, generators). (CLG 5.2.4)

5.12.14 use **energy transformations** and physical effects to explain the interactions of waves and physical effects, (i.e., **Doppler effect**, and **Interference patterns**).

The student will describe and demonstrate how waves can be used to transmit energy (physical, electromagnetic). (CLG 5.4.1)

The student will compare the propagation of mechanical waves (longitudinal, transverse). (CLG 5.4.2)

The student will describe and mathematically calculate wave characteristics (wavelength, frequency/period, velocity, amplitude). (CLG 5.4.3)

The student will describe and demonstrate the general behavior of waves (reflection, refraction, diffraction, superposition, interference, Doppler effect). (CLG 5.4.4)

5.12.19 describe developments in modern Physics (i.e., **nuclear fission**, **photoelectric effect**, wave-particles duality, energy of **light**) and their applications (*e.g.*, *nuclear power*, *MRI*). (i.e., semiconductors).

The student will cite evidence of the quantum nature of matter and its applications (energy of light waves, photoelectric effect, wave/particle duality, applications). (CLG 5.5.1)

The student will explain the processes associated with atomic energy and its applications (atomic energy, radioactive decay, fission, fusion). (CLG 5.5.2)

*6.12.1 analyze and explain the movement of matter and energy through the biosphere (**lithosphere**, **hydrosphere**, **atmosphere**, and **organisms**) and the influence of this movement on weather patterns, climatic zones, and the distribution of life.*

*The student will demonstrate that matter cycles through and between living systems and the physical environment constantly being recombined in different ways (CLG 6.1.1).*

*The student will analyze how the transfer of energy between atmosphere, land masses and oceans results in areas of different temperatures and densities that produce weather patterns and establish climate zones around the earth (CLG 6.1.2).*

*6.12.2 use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of organisms within the environment.*

*The student will explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level*  
(CLG 6.2.1)

The student will explain why interrelationships & interdependencies of organisms contribute to the dynamics of ecosystems.  
(CLG 6.2.2)

The student will conclude that populations grow or decline due to a variety of factors.  
(CLG 6.2.3)

The student will provide examples showing that natural selection leads to organisms that are well suited for survival in particular environments.  
(CLG 6.2.4)

*6.12.4 use concepts from chemistry, physics, biology, and ecology to analyze and interpret the impact both positive (recycling) and negative (toxic wastes) of human activities on the earth's resources (land, water, air, energy, biological).*

*The student will evaluate the interrelationships between humans and air quality.*  
(CLG 6.3.1)

*The student will evaluate the interrelationship between humans and water quality and quantity.*  
(CLG 6.3.2)

*The student will evaluate the interrelationships between humans and land resources.*  
(CLG 6.3.3)

*The student will evaluate the interrelationships between humans and biological resources.*  
(CLG 6.3.4)

*The student will evaluate the interrelationships between humans and energy resources.*  
(CLG 6.3.5)

*6.12.5 investigate and analyze environmental issues from local to global perspectives (e.g., world population, food production and distribution, pollution and epidemics, biodiversity) to develop an action project that protects, sustains, or enhances the natural environment.*

*The student will identify an environmental issue and formulate related research questions.* (CLG 6.4.1)

*The student will design and conduct the research.*  
(CLG 6.4.2)

*The student will interpret findings to form conclusions and make recommendations to help resolve the issue.*  
(CLG 6.4.3)

*The student will apply the conclusions to develop and implement an action project.*  
(CLG 6.4.4)

*The student will analyze the effectiveness of the action project in terms of achieving the desired outcomes.*  
(CLG 6.4.5)