

## MIDDLE SCHOOL SCIENCE GRADUATION COMPETENCIES



“The most important characteristic of competency-based education is that it measures learning rather than time. Students progress by demonstrating their competence, which means they prove that they have mastered the knowledge and skills (called competencies) required for a particular course, regardless of how long it takes.”

*Dr. Robert Mendenhall, President, Western Governor's University*

## **Middle School Science Graduation Competencies**

Middle School Science Graduation Competencies are meant to serve as a guide for teachers and leaders as they prepare students to become scientifically literate citizens, critical and creative independent thinkers, and effective communicators and collaborators. In accordance to our Superintendent's 20/20 Vision, we aim to ensure that every Henry County graduate is truly college and career ready for success in the 21<sup>st</sup> century.

As provided by the research undertaken by the Great Schools Partnership, content area graduation standards are based on state standards and clearly defined learning progressions. They specifically describe the most essential content knowledge that students will need to truly emerge from the educational experience college and career ready. Supporting the Middle School Science Graduation Competencies are relevant performance indicators. Performance indicators are aligned with content-area and cross-curricular state standards, and provide more detailed descriptions of what it means to meet a graduation competency. Scoring criteria for each performance indicator were developed based on best practice and research. The scoring criteria will be used in rubrics for summative assessments across the district to ensure the validity and reliability of scoring for Middle School Science Graduation Competencies for each content area.

The scoring criteria for the Middle School Science Graduation Competencies were collaboratively developed by several dedicated and passionate science teachers from across the district.

Nelven Bedford, Stockbridge Middle

Austin Brock, Austin Road Middle

Christy Collier, Eagle's Landing Middle

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## MIDDLE SCHOOL GRADUATION COMPETENCIES- Curriculum Map

Earth Science						
Graduation Competencies	Content Standards					
	S6E1	S6E2	S6E3	S6E4	S6E5	S6E6
MS1	✓	✓				
MS2			✓	✓		
MS3					✓	✓
Life Science						
Graduation Competencies	Content Standards					
	S7L1	S7L2	S7L3	S7L4	S7L5	
MS4		✓ (a-e)	✓ (a-c)			
MS5				✓		
MS6			✓ (a-c)			✓ (a-c)
MS7	✓ (a,b)					

**MIDDLE SCHOOL GRADUATION COMPETENCIES- Curriculum Map**

Physical Science					
Graduation Competencies	Content Standard				
	S8P1	S8P2	S8P3	S8P4	S8P5
<a href="#"><u>MS8</u></a>	✓ (a,c,d-g)				
<a href="#"><u>MS9</u></a>			✓ (a-c)		✓ (a)
<a href="#"><u>MS10</u></a>		✓		✓ (a-d)	✓ (b,c)

# MIDDLE SCHOOL GRADUATION COMPETENCIES- Earth Science

## Graduation Competency: MS1

### Earth and Space Sciences: Space and Universe

Students will understand and analyze the origins of the solar system and its position in the universe through scientific processes and practices.

#### Performance Indicators

- A.** Construct an explanation of the Big Bang theory based on astronomical evidence, motion of distant galaxies and composition of matter in the universe. (S6E1)
- B.** Evaluate the progression of change in the basic historical scientific models (heliocentric vs. geocentric). (S6E1)
- C.** Develop and use a model to describe the role of gravity in the motions of objects within galaxies and the solar system. (S6E1)
- D.** Analyze and interpret data to determine scale properties of objects in the solar system. (S6E1)
- E.** Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, seasons, and tides. (S6E2)

## Performance Indicators Scoring Criteria Graduation Competency 1

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Construct an explanation of the Big Bang theory based on astronomical evidence, motion of distant galaxies and composition of matter in the universe. (S6E1)</b>	The student can recognize the Big Bang theory as the most widely agreed upon theory for the formation of the universe.	The student can cite evidence to support the Big Bang theory.	The student can construct an explanation of the Big Bang theory based on astronomical evidence, motion of distant galaxies and composition of matter in the universe.	The student can use multiple resources to analyze and synthesize evidence that supports the Big Bang theory (i.e. motion of galaxies, background radiation, composition of matter in the universe).
<b>B. I can evaluate the progression of change in the basic historical scientific models</b>	The student can identify different scientific	The student can compare scientific models and relate the change in the models to the	The student can evaluate the progression of change in the basic historical scientific	The student can connect scientific and technological advances to the progression of basic

<b>of the heliocentric vs. geocentric theories. (S6E1)</b>	models.	progression of scientific knowledge.	models of the heliocentric vs. geocentric theories.	historical scientific models.
<b>C. Develop and use a model to describe the role of gravity in the motion of objects within galaxies and the solar system. (S6E1)</b>	The student can recognize that gravity controls the motion of objects.	The student can relate mass and distance of objects to the effect of gravitational pull on objects in the solar system.	The student can develop and use a model to describe the role of gravity in the motion of objects within galaxies and the solar system.	The student can apply concepts of gravity to NASA's successful launching of satellites into space.
<b>D. Analyze and interpret data to determine scale properties of objects in the solar system. (S6E1)</b>	The student can determine the relative size of planets based upon data provided in a chart.	The student can organize objects in the solar system based on size and distance.	The student can analyze and interpret data to determine scale properties of objects in the solar system.	The student can create a scaled model of the solar system based on size and distance.
<b>E. Develop and use a model of the sun-Earth-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, seasons, and tides. (S6E2)</b>	The student can recognize that the sun, Earth and moon have cyclical patterns.	The student can determine the cause and effect of the sun, Earth, and moon patterns on lunar phases, eclipses, seasons, and tides.	The student can develop and use a model of the sun-Earth-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, seasons, and tides.	The student can critique the impact on humans and the environment if there were no cyclic patterns of the sun, Earth, and moon.

## Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Earth Science

### Graduation Competency: MS2

#### Earth and Space Sciences: Hydrology and Meteorology

Students will understand and analyze the role of water in Earth processes, the dynamics and composition of the atmosphere and global processes influencing weather and climate

#### Performance Indicators

- A. Analyze the composition and structure of the atmosphere and how it protects life and insulates the planet. (S6E4)
- B. Develop a model to describe the cycling of water through Earth's systems driven by energy from the Sun and the force of gravity such as tides. (S6E3 and S6E4)
- C. Collect data to provide evidence of how the motions and complex interactions of air masses results in changes in weather conditions. (S6E4)
- D. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. (S6E4)

### Performance Indicators Scoring Criteria Graduation Competency 2

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Analyze the composition and structure of the atmosphere and how it protects life and insulates the planet. (S6E4)</b>	The student can identify the structure of the atmosphere.	The student can distinguish unique characteristics of each atmospheric layer.	The student can analyze the composition and structure of the atmosphere and how it protects life and insulates the planet.	The student can evaluate what would happen to life on earth if one or more of the sub layers of the atmosphere were taken away.
<b>B. Develop a model to describe the cycling of water through Earth's systems driven by energy from the Sun and the force of gravity (S6E3 and S6E4)</b>	The student can recognize the stages of the water cycle.	The student can compare stages of the water cycle.	The student can develop a model to describe the cycling of water through Earth's systems driven by energy from the Sun and the force of gravity.	The student can analyze and predict how changes in one stage of the water cycle affect other stages.

<p><b>C. Collect data to provide evidence of how the motion and interactions of air masses results in changes in weather conditions. (S6E4)</b></p>	<p>The student can recognize how different air masses interact to form fronts.</p>	<p>The student can compare how different fronts lead to changes in the weather (severe weather systems).</p>	<p>The student can collect data to provide evidence of how the motion and interactions of air masses results in changes in weather conditions.</p>	<p>The student can synthesize data from local or national forecasts to predict a five-day forecast.</p>
<p><b>D. Develop and use a model to describe how unequal heating and the rotation of the Earth cause global winds and ocean currents influence regional climates (S6E4)</b></p>	<p>The student can list the events that are the result of the unequal heating and rotation of the earth.</p>	<p>The student can describe the events that are the result of the unequal heating and rotation of the earth.</p>	<p>The student can develop and use a model to describe how unequal heating and the rotation of the Earth cause global winds and how ocean currents influence regional climates.</p>	<p>The student can analyze data to prove why specific weather events occur in certain regions but not others.</p>

### Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

# MIDDLE SCHOOL GRADUATION COMPETENCIES- Earth Science

## Graduation Competency: MS3

### Earth and Space Sciences: Geology

Students will understand and analyze lithospheric materials, tectonic processes, and the human and environmental impacts of natural and human-induced changes to Earth’s surface.

#### Performance Indicators

- A.** Justify the importance of Earth materials (e.g., rocks, minerals, soils, atmospheric gases, water). (S6E5)
- B.** Determine the composition and formation of the predominate type of rock in your area and create a story explaining the history of the rock including the geologic profile. (S6E5)
- C.** Analyze and justify changes in the Earth’s surface that are due to slow processes (erosion, weathering, mountain building) and rapid processes (landslides, volcanic eruptions, earthquakes, floods). (S6E5)
- D.** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. (S6E5)
- E.** Create a model that demonstrates the behavior of lithospheric plates involved in three major geologic events in the Earth’s surface and the locations of these events. (S6E5)
- F.** Research and evaluate the use of renewable and nonrenewable resources and critique efforts in the United States including (but not limited) to Georgia to conserve natural resources and reduce global warming. (S6E6)
- G.** Create a campaign to raise public awareness and encourage environmental stewardship in your community. (S6E6)
- H.** Create a story about a journey to the center of the earth and describe the similarities and differences encountered along the way, including details like temperature, density, and composition. (S6E5)

## Performance Indicators Scoring Criteria Graduation Competency 3

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Justify the importance of conserving Earth materials (e.g., rocks, minerals, soils,</b>	The student can identify commonly used earth materials.	The student can examine commonly used earth materials and their uses.	The student can justify the importance of conserving Earth’s materials (e.g., rocks, minerals,	The student can design a plan of action to address the conservation of Earth’s materials (e.g.

<b>atmospheric gases, water). (S6E5)</b>			soils, atmospheric gases, water)	rocks, minerals, soils, atmospheric gases, water)
<b>B. Determine the composition and formation of the predominate type of rock in your area and create a story explaining the history of the rock including the geologic profile. (S6E5)</b>	The student can identify the three types of rocks.	The student can classify a set of rocks based on their process of formation and identifying characteristics.	The student can determine the most common type of rock in our area based on the composition and formation of the rock. I can create a story explaining the history of the rock including the geologic profile.	The student can analyze how Stone Mountain formed and describe the events that eventually caused its exposure.
<b>C. Analyze and justify changes in the Earth's surface that are due to slow processes (erosion, weathering, mountain building) and rapid processes (landslides, volcanic eruptions, earthquakes, floods). (S6E5)</b>	The student can list Earth processes that affect the surface of earth.	The student can categorize both slow and rapid processes that change the shape of Earth's surface.	The student can analyze and justify changes in the Earth's surface that are due to slow processes (erosion, weathering, mountain building) and rapid processes (landslides, volcanic eruptions, earthquakes, floods).	The student can research real-world events that change Earth's surface in order to critique the processes as slow or rapid and how it affects life on Earth.
<b>D. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. (S6E)</b>	The student can identify how the surface of Earth has changed over time through the movement of continents.	The student can interpret data on the distribution of fossils and rocks and continental shapes to provide evidence for the theory of Continental Drift.	The student can analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence for the theories of Continental Drift and Plate Tectonics.	The student can connect the movement of Earth's lithosphere with convection inside the mantle.

<p><b>E. Create a model that demonstrates the behavior of lithospheric plates involved in three major geologic events in the Earth's surface and the locations of these events. (S6E5)</b></p>	<p>The student can identify the three types of major geologic events (mountains, earthquakes, and volcanoes)</p>	<p>The student can identify the three types of plate boundaries that result in major geologic events.</p>	<p>The student can create a model that demonstrates the behavior of lithospheric plates involved in three major geologic events (mountains, earthquakes, and volcanoes) in the Earth's surface and the locations of these events.</p>	<p>The student can create a 3D model that demonstrates the behavior of lithospheric plates involved in three major geologic events (mountains, earthquakes, and volcanoes) in the Earth's surface and the locations of these events. The student will also provide real world examples of the locations of these events.</p>
<p><b>F. Research and evaluate the use of renewable and nonrenewable resources and critique efforts in the United States including (but not limited to) Georgia to conserve natural resources and reduce global warming. (S6E6)</b></p>	<p>The student can identify natural resources.</p>	<p>The student can classify natural resources as renewable or nonrenewable and can identify efforts used to conserve these resources.</p>	<p>The student can research and evaluate the use of renewable and nonrenewable resources and critique efforts in the United States including (but not limited to) Georgia to conserve natural resources and reduce global warming.</p>	<p>The student can design a conservation plan for any area outside of the United States including best methods of conserving natural resources in the area and reducing global warming.</p>
<p><b>G. Create a campaign to raise public awareness and encourage environmental stewardship in your community. (S6E6)</b></p>	<p>The student can list ways to reduce, reuse, and recycle every day materials.</p>	<p>The student can identify what environmental stewardship entails in regard to every day materials in their community.</p>	<p>The student can create a campaign to raise public awareness and encourage environmental stewardship of everyday materials in their community.</p>	<p>Within their campaign, the student can include the pros and cons of environmental stewardship and demonstrate why everyday materials need to be conserved in their community.</p>
<p><b>H. Create a story about a journey to the center of the earth and describe the similarities and</b></p>	<p>The student can list the layers of the Earth from the surface to the center.</p>	<p>The student can identify the order of the layers of the Earth and the changes of density and temperature as</p>	<p>The student can create a story that identifies and explains the layers of the Earth and includes details like</p>	<p>The student can formulate an explanation about how scientists have determined temperature,</p>

<b>differences encountered along the way, including details like temperature, density, and composition. (S6E5)</b>		I move from the surface to the center.	temperature, density, and composition.	density, and composition. (P-waves, S-waves, and surface waves).
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### Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Life Science

### Graduation Competency: MS4

#### Life Science: Structure, Function, and Information Processing

Students will apply scientific and engineering practices to understand and analyze molecular, structural, and chemical biology as they relate to biological systems and each level of organization from cells to organ systems.

#### Performance Indicators

- A. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers of cells that may be organized into tissue, organs, and organ systems. (S7L2.c)
- B. Develop and use a model to describe a specific function of an assigned cell as a whole, and the ways individual structures of the cell contribute to its function. (S7L2.b)
- C. Develop a model to explain that cells take in nutrients in order to grow and divide and to make needed materials. (S7L2.a)
- D. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. (S7L2d)
- E. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (S7L2.e)
- F. Develop a model that illustrates the inheritance of specific traits from genes located on chromosomes in both sexual and asexual reproduction. (S7L3.a-b)
- G. Apply the concepts of selective breeding to create an organism (plant or animal) with desired traits and explain the benefits of the traits. (S7L3.c)

### Performance Indicators Scoring Criteria Graduation Competency 4

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers of cells that may be organized into</b>	The student can recall and define key vocabulary and list the characteristics of life.	The student can construct a diagram that displays the levels of organization from simple to more complex.	The student can conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers of cells that may be	The student can design or critique and analyze an investigation to provide evidence that living things are made of cells; either one cell or many

<b>tissue, organs, and organ systems. (S7L2.c)</b>			organized into tissue, organs, and organ systems.	different numbers of cells that may be organized into tissue, organs, and organ systems.
<b>B. Develop and use a model to describe a specific function of an assigned cell as a whole, and the ways individual structures of the cell contribute to its function. (S7L2.b)</b>	The student can state the function of each organelle in a cell.	Given a diagram of the cell, the student can identify each cell structure and state their functions.	The student can develop and use a model to describe a specific function of an assigned cell as a whole, and the ways individual structures of the cell contribute to its overall function.	The student can create and design a real world comparison and create analogies for the cell structures and their functions.
<b>C. Develop a model to explain that cells take in nutrients in order to grow and divide and to make needed materials. S7L2a</b>	The student can recall and define key vocabulary.	The student can compare and contrast active and passive transport and examples of each.	The student can create a model to explain active and passive transport and show that cells take in nutrients in order to grow and divide and to make needed materials (osmosis, diffusion, facilitated diffusion, endocytosis, and exocytosis.	For each method of transport, the student can predict and justify the effect on the cell if the process no longer worked in the cell.
<b>D. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. S7L2d</b>	The student can explain the purpose of photosynthesis, cellular respiration, and fermentation.	The student can create illustrations that show the input and output of photosynthesis, cellular respiration, and fermentation.	The student can develop a model to describe how the molecules in food, water, and gases are rearranged through chemical reactions forming new molecules that support growth and or release energy as	The student can design a structure to be placed on the moon that would provide all of the needed materials for plant growth and explain how this could lead to an enclosed ecosystem.

			matter moves through an organism.	
<b>E. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (S7L2.e)</b>	The student can state the function of each body system.	The student can construct a diagram that shows organization from cell to organism and list the major components of each body system.	The student can explain how body systems work together to carry out daily functions/tasks. Example: walking	Given a human disease/disorder, the student can construct and evaluate an argument to explain how the disease affects individual body systems and their components.
<b>F. Develop a model that illustrates the inheritance of specific traits from genes located on chromosomes in both sexual and asexual reproduction. (S7L3 a-b.)</b>	The student can recall and define key vocabulary.	The student can illustrate the difference between sexual and asexual reproduction and how genes are passed from parent to offspring.	The student can develop a model that illustrates the inheritance of specific traits from genes located on chromosomes in both sexual and asexual reproduction.	The student can use a Punnett square to analyze and defend the probability of an organism inheriting a specific trait from genes located on chromosomes
<b>G. Apply the concepts of selective breeding to create an organism (plant or animal) with desired traits and explain the benefits of the traits. (S7L3.c)</b>	The student can recall and define key vocabulary.	The student can explain the difference between selective breeding and other mechanisms of inheritance.	The student can apply the concepts of selective breeding to create an organism (plant or animal) with desired traits.	The student can apply the concepts of selective breeding to create an organism (plant or animal) with desired traits and explain the benefits of these traits.

### Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Life Science

### Graduation Competency: MS5

#### Life Science: Matter and Energy in Organisms and Ecosystems

Students will apply scientific and engineering practices to understand and analyze the characteristics, functions, and behavioral interactions within an ecosystem.

#### Performance Indicators

- A. Develop a model to describe the cycling of matter and flow of energy among biotic and abiotic components of a chosen or assigned ecosystem. (S7L4.a,b)
- B. Construct an argument supported by empirical evidence that changes to an ecosystem affect populations. (S7L4.c)
- C. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (S7L4c)
- D. Determine mutualistic and competitive relationships in ecosystems. (S7L4d)
- E. Create a tool to provide information of the characteristics of the Earth's major terrestrial biomes and aquatic communities. (S7L4.e)

### Performance Indicators Scoring Criteria Graduation Competency 5

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Develop a model to describe the cycling of matter and flow of energy among biotic and abiotic components of a chosen or assigned ecosystem. (S7L4.a,b)</b>	The student can define key vocabulary and provide examples.	The student can use a given model of a food web to identify each component and the existing feeding relationships among the organisms. In addition, the student can illustrate the flow of matter and energy using arrows.	The student can choose an ecosystem and create a model to describe the cycling of matter and the flow of energy among biotic and abiotic components.	The student can design an enclosed, self-sufficient ecosystem and defend the inclusion of each component.

<p><b>B. Construct an argument supported by empirical evidence that changes to an ecosystem affect populations. (S7L4)</b></p>	<p>The student can recognize that changes in an ecosystem affect the survival of a population.</p>	<p>The student can use a real world example to describe the cause and effect of a change in the ecosystem to a given population.</p>	<p>The student can construct an argument supported by direct observation or experimentation that shows how changes to an ecosystem affect populations.</p>	<p>The student can create a public service announcement to increase awareness that climate change affects the survival of populations.</p>
<p><b>C. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (S7L4c)</b></p>	<p>The student can state the biotic and abiotic limiting factors for a given population in an ecosystem.</p>	<p>Given a set of population data the student can create a graph that accurately represents the data and summarize the trends in population change.</p>	<p>The student can analyze various data sets of ecosystems and create a graph that accurately represents the data and shows the effects of resource availability on organisms and populations of organisms in an ecosystem. Be sure to cite the evidence.</p>	<p>The student can research a declining population of their choice and design a campaign to raise awareness of that declining population that will include a model to show population trends as well as other factors that affect the population and potential solutions.</p>
<p><b>D. Determine mutualistic and competitive relationships in ecosystems. (S7L4d)</b></p>	<p>The student can identify relationships between organisms as competitive or mutualistic.</p>	<p>The student can give examples of competitive and mutualistic relationships.</p>	<p>The student can determine competitive and mutualistic relationships in ecosystems.</p>	<p>The student can observe local ecosystems and create an artifact that demonstrates competitive and mutualistic relationships in those ecosystems and predicts the possible outcome if an organism from the identified relationship is removed from the ecosystem.</p>

<p><b>E. Create a tool to provide information of the characteristics of the Earth's major terrestrial biomes and aquatic communities. (S7L4.e)</b></p>	<p>The student can recognize that key differences that exist between Earth's major terrestrial biomes and aquatic communities.</p>	<p>The student can identify the biotic and abiotic factors of Earth's major terrestrial biomes and aquatic communities.</p>	<p>The student can create a tool that can be used to identify Earth's major terrestrial biomes and aquatic communities and emphasizes the biotic and abiotic factors of those biomes.</p>	<p>The student can investigate an environmental issue (positive or negative) and demonstrate the interconnectedness of the terrestrial biomes and aquatic communities by showing the effects of human activity on the biotic and abiotic factors of those major ecosystems.</p>
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### Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Life Science

### Graduation Competency: MS6

#### Life Science: Growth, Development, and Reproduction of Organisms, Natural Selection, and Adaptations

Students will apply scientific and engineering practices to understand and analyze the relationship between genetics, adaptation, and biodiversity.

#### Performance Indicators

- A. Using a created population, demonstrate the role of genes and chromosomes in the process of inheriting a specific trait and how the trait may enhance the survival of an organism and, consequently, remain in the population through natural selection. (S7L3.a and S7L5.b)
- B. Gather and synthesize information about the technologies that have impacted the way humans influence the inheritance of desired traits in organisms. (S7L3.c)
- C. Using a selected organism, conduct research and create a model to demonstrate how the organism has changed over time and predict what it can look like in the future (include the environmental conditions to influence the future prediction). (S7L5.a)
- D. Generate an argument to explain how reproduction (sexual and asexual) contributes to the process of natural selection. (S7L3.b and S7L5.b.)
- E. Analyze data to demonstrate and explain how natural selection may lead to increase and decreases of specific traits in populations over time. (S7L5.b)
- F. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. (S7L5.c)
- G.

### Performance Indicators Scoring Criteria Graduation Competency 6

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Using a created population, demonstrate the role of genes and chromosomes in the process of inheriting a specific trait and how the trait may enhance the</b>	The student can define the key vocabulary and state the principles of natural selection.	The student can recognize that variations of a physical trait exist and predict the type of environment each variation would be best suited for.	Using a selected population, the student can demonstrate the role of genes and chromosomes in the process of inheriting a specific trait, how the trait may enhance the survival of an	The student can create an environmental scenario that would cause a species to undergo physical changes and illustrate the process of natural selection over time through a

<p><b>survival of an organism and, consequently, remain in the population through natural selection. (S7L3.a and S7L5.b)</b></p>			<p>organism within the population and, consequently, remain in the population through natural selection.</p>	<p>simulation.</p>
<p><b>B. Gather and synthesize information about the technologies that have impacted the way humans influence the inheritance of desired traits in organisms. (S7L3.c)</b></p>	<p>The student can identify (list) the technologies that have impacted the way humans influence the inheritance of desired traits in organisms.</p>	<p>The student can summarize the basic method of each technology that has impacted the way humans influence the inheritance of desired traits in an organism.</p>	<p>The student can create an informational presentation that explains the technologies that have impacted the way humans influence the inheritance of desired traits in organisms.</p>	<p>The student can cite evidence and create an argument based on the moral or ethical implications of technologies that have impacted the way humans influence the inheritance of desired traits in organisms.</p>
<p><b>C. Using a selected organism, conduct research and create a model to demonstrate how the organism has changed over time and predict what it can look like in the future (include the environmental conditions to influence the future prediction). (S7L5.a)</b></p>	<p>The student can list environmental conditions that could cause a species to change over time.</p>	<p>Using a selected organism, the student can conduct research and create a model to demonstrate how the organism has changed over time.</p>	<p>Using a selected organism, the student can conduct research and create a model to demonstrate how the organism has changed over time and predict what it can look like in the future (include the environmental conditions that led to your the future prediction.</p>	<p>The student can create a fictitious organism and show the evolution of the organism over time and explain the environmental conditions that caused natural selection for various traits to occur.</p>
<p><b>D. Generate an argument to explain how reproduction (sexual and asexual) contributes to</b></p>	<p>The student can compare the input and output of sexual and asexual reproduction</p>	<p>The student can list the pros and cons of sexual and asexual reproduction.</p>	<p>The student can cite evidence and construct an argument to explain the roles of sexual and</p>	<p>The student can analyze the impact on a species if a mutation suddenly occurred that prevented the</p>

<b>the process of natural selection. (S7L3.b and S7L5.b.)</b>			asexual reproduction on the varying rate of genetic change in a species.	species from reproducing sexually and prove how this could affect its survival.
<b>E. Analyze data to demonstrate and explain how natural selection may lead to increase and decreases of specific traits in populations over time. (S7L5.b)</b>	Given an organism, the student can sketch the variations of a physical trait and explain why the variation would be beneficial for the organism.	Given an organism, the student can identify the physical variations in the species and predict what environmental conditions might cause the trait to change over time.	Given population data for an organism, the student can analyze the data to demonstrate how natural selection effects physical changes in an organism that may lead to increases and decreases in specific traits in populations over time.	The student can research and collect population data for two organisms that have co-evolved. The student can analyze the data and demonstrate how natural selection effects physical changes in one or both organisms that may lead to increases and decreases in specific traits over time.
<b>F. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. (S7L5.c)</b>	The student can identify the relative age of fossils in a fossil column.	The student can select an organism and illustrate the physical changes in the species over time.	The student can analyze and interpret data for patterns in the fossil record that document the change of life forms over time.	The student can collect and display fossil column diagrams and cite evidence for the existence of Pangea.

## Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Life Science

### Graduation Competency: MS7

#### Life Science: Classification and the diversity of organisms

Students will apply scientific and engineering practices to understand and analyze the structural similarities of organisms and how they can be compared scientifically.

#### Performance Indicators

- A. Develop a dichotomous key that can be used to identify a collected group of organisms and determine their scientific name. (S7L1.a.)
- B. Identify the physical characteristics of an organism and determine the placement of that organism into the six kingdom classification system. (S7L1.b)

### Performance Indicators Scoring Criteria Graduation Competency 7

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Develop a dichotomous key that can be used to identify a collected group of organisms and determine their scientific names. S7L1a</b>	The student can classify organisms based on their physical characteristics.	The student can identify the correct format of a scientific name and explain the purpose of a dichotomous key.	The student can use a dichotomous key to identify a collected group of organisms and determine their scientific names.	The student can develop a dichotomous key that can be used to identify a collected group of organisms and determine their scientific names.
<b>B. Identify the physical characteristics of an organism and determine the placement of the organism into the six-kingdom classification system. (S7L1.b)</b>	The student can identify and list the six-kingdom classification system.	The student can create a visual that shows the physical characteristics of each kingdom in the six kingdom classification system.	The student can identify the physical characteristics of an organism from each kingdom and determine its placement into the six-kingdom classification system.	The student can develop a fictitious organism, explain its physical characteristics and defend its placement into the six kingdom classification system.

### Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Physical Science

### Graduation Competency: MS8

#### Physical Sciences: Structure/Properties of Matter and Interactions

Students will understand and analyze atoms, matter, reactions, and interactions through scientific processes and practices.

#### Performance Indicators

- A. Develop models to describe the atomic composition of simple molecules and extended structures (S8P1.a).
- B. Use the Periodic Table of Elements as a model to analyze and interpret the characteristic properties of elements, and predict relative properties of elements based on the patterns of electrons in the outermost energy levels of atoms (S8P1.f).
- C. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred (S8P1.d and e).
- D. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed (S8P1.c).
- E. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved (S8P1.g).

### Performance Indicators Scoring Criteria Graduation Competency 8

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Develop models to describe the atomic composition of simple molecules and extended structures (S8P1.a).</b>	The student can recognize the difference between an atom and a molecule.	The student can classify atoms and molecules into the correct category and summarize the reasons for my selections. (S8P1a)	The student can develop models to describe the atomic composition of simple molecules and extended structures.	The student can analyze models that describe the atomic composition of simple molecules and extended structures (i.e. compounds).
<b>B. Use the Periodic Table of Elements as a model to analyze and interpret the characteristic properties of</b>	The student can identify the sections of the Periodic Table of Elements where the	The student can use groups and periods to identify patterns of elements in the Periodic Table of	The student can use the Periodic Table of Elements as a model to analyze and interpret the	The student can critique the outcome of a simple chemical reaction based on the outermost

<b>elements, and predict relative properties of elements based on the patterns of electrons in the outermost energy levels of atoms (S8P1.f).</b>	metals, nonmetals, and metalloids are located.	Elements.	characteristic properties of elements, and predict relative properties of elements based on the patterns of electrons in the outermost energy level.	electron states of atoms, trends in the Periodic Table of Elements, and knowledge of the patterns of chemical properties.
<b>C. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred (S8P1.d and e).</b>	The student can recognize whether the mixing of two or more substances results in a new substance.	The student can observe the mixing of two substances and explain whether the result became a new substance or not.	The student can analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	The student can design an investigation that shows the mixing of two substances that results in a new substance and that does not result in a new substance.
<b>D. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed (S8P1.c)</b>	The student can recognize that particle motion changes with the heating and cooling of a substance.	The student can predict how the motion of particles will change with the heating and cooling of a substance.	The student can develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	The student can design an experiment that will demonstrate the effect of thermal energy on particle motion and analyze the data collected during experimentation.
<b>E. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved (S8P1.g).</b>	The student can label chemical reactions and count the number of atoms in the reactant and the product.	The student can compare the reactant and the product of a chemical reaction to determine if mass is conserved.	The student can develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	The student can apply atomic and chemical reaction information to design chemical equations and balance them.

## Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Physical Science

### Graduation Competency: MS9

#### Physical Sciences: Forces, Motions, and Interactions

Students will understand and analyze forces, mass, motion, and interactions through scientific processes and practices.

#### Performance Indicators

- A. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object (S8P3.b).
- B. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects (S8P3.b, S8P5a).
- C. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object (S8P3.b).
- D. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact (S8P5.a).
- E. Develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object (S8P3.a).
- F. Develop models to describe the effect of simple machines on work and present evidence to support the claim that simple machines make work easier (S8P3.c).

### Performance Indicators Scoring Criteria Graduation Competency 9

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object (S8P3.b).</b>	The student can recognize forces acting on an object as balanced or unbalanced.	The student can show the effect of balanced and unbalanced forces on an object based on its motion.	The student can plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	The student can connect Newton's Three Laws of Motion to balanced and unbalanced forces by designing real-life models or examples.
<b>B. Construct and present arguments using evidence</b>	The student can identify that gravitational interactions are	The student can construct a graph to show that gravitational	The student can construct and present arguments using evidence to	The student can critique arguments that gravitational

<b>to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects (S8P3.b, S8P5a).</b>	attractive forces.	interactions are dependent on the masses of the objects.	support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	interactions are attractive and depend on the masses of interacting objects.
<b>C. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object (S8P3.b).</b>	The student can identify and illustrate Newton's 2 <sup>nd</sup> Law of Motion.	The student can show how force, mass, and acceleration relate to Newton's 2 <sup>nd</sup> Law of Motion.	The student can plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	The student can prove that the more mass an object has, the more momentum it will have using the mathematical formula for Newton's 2 <sup>nd</sup> Law.
<b>E. Develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object (S8P3.a).</b>	The student can identify the difference between speed, acceleration and velocity and recall the definition of net forces.	The student can relate the formulas for speed, acceleration, and velocity to the graphs that demonstrate the effects of net forces on moving objects.	The student can develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object.	The student can develop and critique a prototype) and make suggestions on how to increase speed and acceleration by analyzing all data collected and the net forces on the design.
<b>F. Develop models to describe the effect of simple machines on work and present evidence to support the claim that simple machines make work easier (S8P3.c).</b>	The student can list the six simple machines and identify how they make work easier.	The student can show how simple machines make work easier by using mathematical formulas.	The student can develop models to describe the effect of simple machines on work and present evidence to support the claim that simple machines make work easier (S8P3.c).	The student can design and develop a complex simple machine encompassing all six simple machines to complete a simple task.

## Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>

## MIDDLE SCHOOL GRADUATION COMPETENCIES- Physical Science

### Graduation Competency: MS10

#### Physical Sciences: Energy, Waves, Electricity, Magnetism, and Interactions

Students will understand and analyze energy and the characteristics of waves as demonstrated through the integration of scientific practices.

#### Performance Indicators

- A.** Gather, analyze, and interpret data to describe the different forms of energy and energy transfer (S8P2).
- B.** Use representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave (S8P4.a).
- C.** Develop and design scientific investigations regarding absorption, reflection, refraction, and diffraction of light (S8P4.b and c.).
- D.** Develop and use models to describe that waves are reflected, absorbed, or transmitted through various materials (S8P4.d).
- E.** Develop a model to demonstrate the advantages and disadvantages of series and parallel circuits and how energy is transferred (S8P5.b).
- F.** Plan and conduct an investigation to provide evidence that electric currents and magnets can exert force on each other (S8P5.c).

### Performance Indicators Scoring Criteria Graduation Competency 10

Performance Indicator	Emerging	Progressing	Competent	Exemplary
<b>A. Gather, analyze, and interpret data to describe the different forms of energy and energy transfer (S8P2).</b>	The student can identify and describe the different forms of energy and energy transfer.	The student can relate examples of energy transformation to the Law of Conservation of Energy.	The student can gather, analyze, and interpret data to describe the different forms of energy and energy transfer.	The student can research real-world scenarios to critique and prove the benefits of using the various forms of energy in different locations.

<p><b>B. Use representations to describe a simple model for waves that includes how the properties of a wave are related to the energy in a wave (S8P4.a).</b></p>	<p>The student can identify the types of waves and identify their parts.</p>	<p>The student can compare how different amounts of energy can change the wave properties of both transverse and longitudinal waves.</p>	<p>The student can use representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave (S8P4.a).</p>	<p>The student can design a demonstration or experiment that illustrates wave properties.</p>
<p><b>C. Develop and design scientific investigations regarding absorption, reflection, refraction, and diffraction of light (S8P4.b and c.).</b></p>	<p>The student can define absorption, reflection, refraction and diffraction of light.</p>	<p>The student can classify real world examples as absorption, reflection, refraction, and diffraction.</p>	<p>The student can develop and design scientific investigations regarding absorption, reflection, refraction, and diffraction of light (S8P4.b and c.).</p>	<p>The student can research and analyze findings to determine how the human eye interprets light using various wave behaviors.</p>
<p><b>D. Develop and use models to describe that waves are reflected, absorbed, or transmitted through various materials (S8P4.d).</b></p>	<p>The student can illustrate how different medium cause a wave to be absorbed, reflected, or transmitted.</p>	<p>The student can predict how a wave will interact with different medium.</p>	<p>The student can develop and use models to describe that waves are reflected, absorbed, or transmitted through various materials (S8P4.d).</p>	<p>The student can research how different materials are chosen to produce the desired effect on waves in various types of structures.</p>
<p><b>E. Develop a model to demonstrate the advantages and disadvantages of series and parallel circuits and how energy is transferred (S8P5.b).</b></p>	<p>The student can recognize the difference between a series and parallel circuit.</p>	<p>I can compare how series and parallel circuit transfer energy.</p>	<p>The student can develop a model to demonstrate the advantages and disadvantages of series and parallel circuits and how energy is transferred (S8P5.b).</p>	<p>The student can analyze and design a schematic diagram including series and parallel circuits.</p>
<p><b>F. Plan and conduct an investigation to provide evidence that electric currents and</b></p>	<p>The student can define and describe electric currents, magnets, and electromagnets</p>	<p>The student can predict electromagnetic forces using provided materials</p>	<p>The student can plan and conduct an investigation to provide evidence that electric currents and</p>	<p>The student can defend their design and critique the design of others for</p>

<b>magnets can exert force on each other (S8P5.c).</b>	and their fields.	and data.	magnets can exert force on each other (S8P5.c).	efficiency.
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## Suggested Performance Tasks

- Selected Tasks from <https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/Science6-8.aspx>