

Appendix 3-B

NDSA for Science Range Achievement-Level Descriptors

NDSA for Science Range Achievement-Level Descriptors

Exhibit B-1. NDSA for Science Achievement-Level Descriptors, Grade 4

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|--|--|---|---|
| Earth and Space Sciences | | | | |
| ESS1: Earth’s Place in the Universe | Identify that different types of fossils and rock layers exist in rock formations that can help explain observable features of Earth’s landscape. | Recognize patterns in fossils and rock layers that explain the ordered observable features of Earth’s landscape. | Analyze and interpret pictorial displays of data to use as evidence in order to explain the ordered, observable features of Earth’s landscape. | Evaluate and revise displays of data to make a prediction regarding the ordered, observable features of Earth’s landscape. |
| ESS2: Earth’s Systems | Make observations from data and/or collect information to identify parts of a model and reveal patterns that would show patterned features of Earth, including weather, climate, and physical and biological constructive or destructive forces. | Represent data sets or graphs, and/or carry out investigations using models or information that shows patterned features of Earth, including weather, climate, and physical and biological constructive and/or deconstructive forces. | Develop and/or use simple models, carry out investigations or evaluate evidence using mathematical thinking, reasoning, and information regarding patterned features of Earth, including weather, climate, and physical and biological constructive and destructive forces. | Revise a model, analyze data sets from an investigation using mathematical thinking, and research how to better communicate or predict patterned features of Earth, including weather, climate, and physical and biological constructive and deconstructive forces. |
| ESS3: Earth and Human Activity | Use information and observations from sources to identify either weather-related hazards that affect humans or human activity that affects Earth’s resources and environments. | Identify reliable sources and use obtained information to identify a solution to help explain the cause and effect relationship of either weather-related hazards on humans or human activity on the Earth’s resources and environments. | Obtain and use evidence from reliable sources to generate and evaluate the merits of multiple solutions that could explain and reduce the cause and effect relationship of either weather-related hazards on humans or human activity on | Evaluate, compare, and revise multiple solutions to a problem, using evidence obtained from reliable sources, to predict changes that can occur in the cause and effect relationships of either weather-related hazards on humans or |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|--|--|--|--|---|
| | | | the Earth's resources and environments. | human activity on the Earth's resources and environments. |
| Life Sciences | | | | |
| LS1: From Molecules to Organisms: Structure and Processes | Identify components of a model that represent parts of a life cycle or behavioral system of organisms and make observations about organisms that need food for energy and materials to grow and repair their internal and external structures. | Use a simple model to represent the life cycles or behavioral systems of organisms to support an argument and identify data as evidence to support that organisms need food for energy and materials to grow and repair their internal and external structures. | Develop and use a model to describe patterns in the life cycles or behavioral systems of organisms and use evidence to construct an argument that organisms need food for energy and materials to grow and repair their internal and external structures. | Evaluate and revise a model that describes patterns in the life cycles or behavioral systems of organisms when a variable changes and compare and refine arguments that organisms need food for energy and materials to grow and repair their internal and external structures. |
| LS2: Ecosystems: Interactions, Energy, and Dynamics | Make observations that can help support an argument about interactions of organisms within a group in an ecosystem. | Identify evidence to support a claim to describe the interactions of organisms within a group in an ecosystem. | Construct an argument explaining the interactions of organisms within a group in an ecosystem. | Evaluate and revise a claim that describes the interactions of organisms within a group in an ecosystem. |
| LS3: Heredity: Inheritance and Variation of Traits | Collect and record data from pictures, drawings, and/or text to help describe that organisms inherit their appearance and function and make an observation about an organism when its environment changes. | Use data collected from tables and various graphical displays to support an explanation of the patterns in traits that organisms inherit, which dictate how they look and function; and identify information that would help explain what happens to an organism if the environment changes. | Analyze and interpret various forms of data to explain the patterns in traits that organisms inherit, which dictate how they look and function; and construct an explanation using evidence that supports that an organism has changed in response to environmental changes. | Construct, analyze, and interpret tables and graphical displays of data in order to construct and revise an explanation for the patterns in traits that organisms inherit, which dictate how they look and function; and predict what would happen to an organism if its environment continues to change. |

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|---|--|---|---|--|
| LS4: Biological Evolution: Unity and Diversity | Recognize that past or present organism characteristics can be used as evidence to support that when there is a change in the environment, certain individual organisms could have variations in traits that lead to advantages in survival and reproduction; and use observations to support that current, living organisms can only survive in particular environments or resemble organisms that once lived on Earth. | Demonstrate relationships in past and present organism characteristics to provide evidence that when there is a change in the environment, certain individual organisms could have variations in traits that lead to advantages in survival and reproduction, or that living organisms resemble organisms that once lived on Earth. | Analyze and interpret past and present organism characteristics to either provide evidence that when there is a change in the environment, certain individual organisms could have variations in traits that lead to advantages in survival and reproduction, or that living organisms resemble organisms that once lived on Earth. | Analyze and interpret past and present organism characteristics to evaluate and revise a constructed explanation that states that with a change in the environment, certain individual organisms could have variations in traits that lead to advantages in survival and reproduction, or that living organisms resemble organisms that once lived on Earth. |
| Physical Sciences | | | | |
| PS2: Motion and Stability: Forces and Interactions | Use questions and components of an investigation to observe the relationship between balanced and unbalanced forces, magnetism, and an object's motion. | Use observations from an investigation to provide evidence to determine cause and effect relationships between balanced and unbalanced forces, including magnetic forces, on an object's motion. | Question, plan, and conduct an investigation, and/or use produced data to provide evidence to determine cause and effect relationships between balanced and unbalanced forces, including magnetic forces, on an object's motion. | Question, conduct, and compare investigations and/or use produced data to predict cause and effect relationships between balanced and unbalanced forces, including magnetic forces, on an object's motion. |
| PS3: Energy | Inquire based on given observations about how energy can be transferred from stored and/or motion energy to different forms like | Make observations using produced data to question how energy can be transferred from stored and/or motion energy to | Question and use produced data to provide evidence on how energy can be transferred from stored and/or motion energy to different forms like sound, | Evaluate and revise questions by using produced data to make predictions and provide evidence for how energy can be transferred from stored and/or motion |

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|---|--|--|---|--|
| | sound, light, and electrical currents. | different forms like sound, light, and electrical currents. | light, and electrical currents and predict changes to energy when objects collide. | energy to different forms like sound, light, and electrical currents. |
| PS4: Waves and their Applications in Technologies for Information Transfer | Identify parts of a wave model and identify patterns in information being transmitted using waves. | Develop and/or use a simple model to make observations about waves and record evidence that would help explain patterns in information transmitted by waves. | Develop a model to describe and compare patterns of waves and the transfer of information; and use evidence to support an explanation for how information is transmitted using waves. | Revise a model to make predictions and compare patterns of waves and make predictions about patterns in information being transmitted using waves. |

Exhibit B-2. NDSA for Science Achievement-Level Descriptors, Grade 8

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|--|---|---|---|
| Earth and Space Sciences | | | | |
| ESS1: Earth’s Place in the Solar System | Identify components of a model that measures and collects evidence to explain the similarities and differences in the patterned motions of the sun-Earth-moon system, the role of gravity in the motion of galaxies and the solar system, the scale of objects in the solar system, and the relative occurrence of events in Earth’s history. | Develop and/or use a simple model or graphical display to identify data from tables and other graphical displays that can be used as pieces of evidence to explain the patterned motions of the sun-Earth-moon system, the role of gravity in the motion of galaxies and the solar system, the scale of objects in the solar system, and the relative occurrences of events in Earth’s history. | Develop and/or use a model using graphical displays of data that explain the patterned motions of the sun-Earth-moon system, the role of gravity in the motion of galaxies and the solar system, the scale of objects in the solar system, and the relative occurrence of events in Earth’s history. | Evaluate and revise a model based on constraints and data limitations that explain the patterned motions of the sun-Earth-moon system, the role of gravity in the motion of galaxies and the solar system, the scale of objects in the solar system, and the relative occurrence of events in Earth’s history. |
| ESS2: Earth’s Systems | Make observations from graphical data to help identify the components of a model that help explain the patterns in the flow or cycling of energy and matter throughout Earth’s systems, including the sun and Earth’s interior as primary energy sources; and identify evidence to explain that Earth’s processes have changed Earth’s surface at varying spatial and time scales. | Use a model or investigation to identify patterns from bar graphs, pictographs, and other various graphical data that support how energy and matter flow or cycle throughout Earth’s systems, including the sun and Earth’s interior as primary energy sources; and organize evidence to explain how Earth’s processes have changed | Analyze data from an investigation to develop, use, and/or revise a model that shows patterns in the flow or cycling of energy and matter throughout Earth’s systems, including the sun and Earth’s interior as primary energy sources; and interpret evidence to construct an explanation for how Earth’s processes have changed Earth’s surface at varying spatial and time scales. | Evaluate and revise a model to generate data that support an explanation that shows patterns in how energy and matter flow or cycle throughout Earth’s systems, including the sun and Earth’s interior as primary energy sources; and evaluate the impact of new data by predicting how Earth’s processes will change Earth’s surface at varying spatial and time |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|--|--|--|---|--|
| | | Earth's surface at varying spatial and time scales. | | scales if a new variable is introduced. |
| ESS3: Earth and Human Activity | Identify scientific arguments using collected and/or graphically represented evidence regarding the dependency of humans on the environment for different resources; and identify evidence that can help design a simple solution that minimizes the effect of humans on the environment or explain the observed patterns that emerge between natural hazards and their related geological forces. | Apply scientific ideas to explain the uneven distribution of natural resources and human dependence on the environment for those resources and design a simple solution that minimizes the effect of humans on the environment; and explain the observable patterns in the history of natural hazards and their related geological forces. | Analyze and interpret sets of data regarding the uneven distribution of natural resources and human dependence on the environment for those resources to design a solution that could minimize the effect of humans on the environment; and explain the observable patterns seen in the data from the history of natural hazards and their related geological forces. | Analyze and interpret sets of data regarding the uneven distribution of natural resources and human dependence on the environment for those resources to evaluate and revise a design solution that minimizes the effect of humans on the environment; and explain the effect of humans on the environment and predicts future patterns of natural hazards when considering the impact of humans on the environment. |
| Life Sciences | | | | |
| LS1: From Molecules to Organisms: Structure and Processes | Organize information from an investigation to identify components of a model or support an explanation using evidence that all living things are made up of cells that work together to form more complex structures and systems, that both plants and animals convert energy into food sources but the process to do so is | Use information from an investigation to support an explanation and develop and/or use a simple model to explain that all living things are made up of cells that work together to form more complex structures and systems, that both plants and animals convert energy into food sources but the process to do so is different, and that | Conduct an investigation to provide evidence and develop and/or use a model to explain that all living things are made up of cells that work together to form more complex structures and systems, that both plants and animals convert energy into food sources but the process to do so is different, and that characteristic animal | Evaluate and revise a model or explanation using investigative data as evidence to support an explanation that all living things are made up of cells that work together to form more complex structures and systems, that both plants and animals convert energy into food sources but the process to do so is different, and that |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|--|---|--|---|
| | different, and that characteristic animal behaviors and specialized plant structures affect the probability of reproduction. | characteristic animal behaviors and specialized plant structures affect the probability of reproduction. | behaviors and specialized plant structures affect the probability of reproduction. | characteristic animal behaviors and specialized plant structures affect the probability of reproduction. |
| LS2: Ecosystems: Interactions, Energy, and Dynamics | Identify components of a model to explain the dynamic relationships and interactions between the diverse types of living and nonliving parts of an ecosystem, including the flow of energy and the cycling of matter among organisms and abiotic components of an ecosystem; and organize data to support a solution to mitigate disruptions to an ecosystem by human access to natural resources. | Use a model to explain the dynamic relationships and interactions between the diverse types of living and nonliving parts of an ecosystem, including the flow of energy and cycling of matter among biotic and abiotic components; and organize data to identify patterns that support a solution to mitigate disruptions to an ecosystem by human access to natural resources. | Develop a model to explain and predict the dynamic relationships and interactions between the diverse types of living and nonliving parts of an ecosystem, including the flow of energy and cycling of matter among biotic and abiotic components; and analyze and interpret data to design a solution to mitigate disruptions to an ecosystem by human access to natural resources. | Analyze and revise a model that explains and supports the dynamic relationships and interactions between the diverse types of living and nonliving parts of an ecosystem, including the flow of energy and the cycling of matter among biotic and abiotic components when a variable in the system is changed; and evaluate limitations of data when analyzing and interpreting data to design a solution to mitigate disruptions to an ecosystem by human access to natural resources. |
| LS3: Heredity: Inheritance and Variation of Traits | Identify the components of a model that describes the relationship among variables that show why sexual/asexual reproduction may have different effects on genetic variation in offspring and how complex and | Develop and/or use a simple model to represent cause and effect relationships to describe either why sexual/asexual reproduction may have different effects on genetic variation in offspring and why structural changes to | Develop and/or use a model to describe the relationship among variables that show either why sexual/asexual reproduction may have different effects on genetic variation in offspring and how complex and | Evaluate and revise a model that explains the relationship among variables as to why sexual/asexual reproduction may have different effects on genetic variation in offspring or predicts what changes |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|--|---|
| | microscopic structural changes to genes (mutations) can be analyzed to determine how they affect the structure and function of an organism. | genes (mutations) affect the structure and function of an organism. | microscopic structural changes to genes (mutations) can be analyzed to determine how they affect the structure and function of an organism. | would occur in the function of an organisms if there is a mutation in the organism's genes. |
| LS4: Biological Evolution: Unity and Diversity | Identify evidence in data sets that shows that a species has changed over time; and identify scientific ideas to support an explanation for how humans influence the biodiversity of an area and how natural or artificial selection can give some organisms an advantage in survival and reproduction. | Organize and identify patterns in large data sets to explain why species can change over time and communicate the similarities or differences found in past and present organisms or fossil records of past environmental conditions; and gather and use data to construct an explanation for how humans influence the biodiversity of an area and how natural or artificial selection can give some organisms an advantage in survival and reproduction. | Analyze and interpret patterns in large data sets to explain why species can change over time and communicate the similarities or differences found in past and present organisms or fossil records of past environmental conditions; and gather and synthesize data to construct an explanation for how humans influence the biodiversity of an area and how natural or artificial selection can give some organisms an advantage in survival and reproduction. | Analyze and evaluate an explanation using large data sets that show the similarities or differences found in past and present organisms or fossil records of past environmental conditions; and apply mathematical models and concepts of probability to form an explanation that as humans influence the biodiversity of an area, natural or artificial selection can give some organisms an advantage in survival and reproduction. |
| Physical Sciences | | | | |
| PS1: Matter and Its Interactions | Identify the components of a model that explains the conservation of mass when substances react; and identify data explaining that the properties of matter depend on its atomic and molecular composition and | Develop and/or use a simple model to explain the conservation of mass when two substances react; and interpret data on the properties of matter to determine whether a chemical reaction has | Analyze patterns in graphical displays of data and develop and/or use a model to explain the conservation of mass when two substances react; and use the properties of matter to determine whether a | Evaluate and revise a model to explain the conservation of mass when substances react; and use evidence to predict how changes to a molecule's structure or thermal energy can affect its properties. |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|--|--|--|--|
| | that particle motion changes when thermal energy in a system is changed. | occurred, including the composition of atoms and molecules that make up matter, and showing that particle motion changes when thermal energy in a system is changed. | chemical reaction has occurred, including the composition of atoms and molecules that make up matter, and showing that particle motion changes when thermal energy in a system is changed. | |
| PS2: Motion and Stability: Forces and Interactions | Identify components of an investigation and identify data regarding the relationships between mass, force, and motion, and the attractive and repulsive forces that act at a distance (electric, magnetic, and gravitational forces) that could be used to support a claim. | Conduct an investigation and organize and use data to support a claim regarding the relationships between mass, force, and motion, and the attractive and repulsive forces that act at a distance (electric, magnetic, and gravitational forces). | Plan and conduct an investigation and analyze and interpret data to make and support a claim regarding the relationships between mass, force, and motion, and the attractive and repulsive forces that act at a distance (electric, magnetic, and gravitational forces). | Conduct, evaluate, and revise an investigation and analyze and evaluate data to support a claim and make predictions about the relationships between mass, force, and motion, and the attractive and repulsive forces that act at a distance (electric, magnetic, and gravitational forces). |
| PS3: Energy | Identify components of a model that investigates how kinetic and potential energy transform and how kinetic energy is transferred to another object; and collect and record data for an investigation that provides data regarding the temperature and total energy of a system and its dependency on a variety of factors, including the types and states of matter, as | Develop and/or use a simple model to describe how kinetic and potential energy transform and how kinetic and thermal energy are transferred to another object; and collect and record data regarding the temperature and total energy of a system and its dependence on a variety of factors, including the types and states of matter, as | Develop and/or use a model or investigation to construct an argument to support a claim about how kinetic and potential energy transform and how kinetic and thermal energy are transferred to another object; and analyze data from an investigation to provide evidence that the temperature and total energy of a system is dependent on a variety of | Evaluate and/or revise a model to predict changes to kinetic, potential, and thermal energy, including how energy is transformed or transferred to another object; and predict evidence that will help construct an argument that supports a claim that the temperature and total energy of a system is dependent on a variety of factors, including the types |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|--|--|--|
| | well as the amount of matter involved. | well as the amount of matter involved. | factors, including the types and states of matter, as well as the amount of matter involved. | and states of matter, as well as the amount of matter involved. |
| PS4: Waves and Their Applications in Technologies for Information Transfer | Identify the mathematical components in a model to describe the patterns observed between wave characteristics and wave energy; and identify a claim with evidence that shows that waves are reflected, absorbed, or transmitted through various materials, and make observations about their applications in technology. | Use mathematical representations in a model to describe the patterns observed between wave characteristics and wave energy; and support a claim with evidence to show that waves are reflected, absorbed, or transmitted through various materials and that they have useful applications in technology. | Develop and use a mathematical model to describe the patterns observed between wave characteristics and wave energy; and construct a claim supported by evidence to show that waves are reflected, absorbed, or transmitted through various materials, and about their applications in technology. | Evaluate and revise a mathematical model to predict patterns between wave characteristics and wave energy; and integrate qualitative, quantitative, and technical data to provide evidence to support a claim that waves are reflected, absorbed, or transmitted through various materials, and evaluate and revise claims about ways that waves are used in technology. |

Exhibit B-3. NDSA for Science Achievement-Level Descriptors, Grade 10

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|--|--|--|--|---|
| Life Sciences | | | | |
| LS1: From Molecules to Organisms: Structure and Processes | Identify the relationships between variables that contribute to the feedback mechanisms that maintain homeostasis through the structure, function, and processes of living systems; and identify the components and limitations of a model that can be used to support an explanation for how cellular respiration transfers energy and matter through the body, forming different products and replicating DNA and protein synthesis. | Conduct an investigation to collect data that will serve as evidence for a model that shows that feedback mechanisms maintain homeostasis through the structure, function, and processes of living systems; and use collected data to support a claim regarding how cellular respiration transfers energy and matter through the body, forming different products and replicating DNA and protein synthesis. | Plan and conduct an investigation and develop and use a model to show that feedback mechanisms maintain homeostasis through the structure, function, and processes of living systems; and evaluate data from an investigation to construct an explanation for how cellular respiration transfers energy and matter through the body, forming different products and replicating DNA and protein synthesis. | Plan and conduct an investigation and evaluate and revise a model to explain what happens to the feedback mechanisms that maintain homeostasis through the structure, function, and processes of living systems when a variable is changed; and apply scientific reasoning, theory, and/or models to make and support a claim that cellular respiration transfers energy and matter through the body, forming different products and replicating DNA and protein synthesis. |
| LS2: Ecosystems: Interactions, Energy, and Dynamics | Use mathematical representations to identify components or variables in the cycling and flow of matter and energy among organisms in an ecosystem; and identify evidence that supports the claim that interactions with biotic and abiotic factors in ecosystems | Use mathematical representations to construct an explanation with data that shows how energy and matter flow and cycle among organisms in an ecosystem; evaluate and identify patterns seen in data that can be used as evidence to explain the interactions of | Create and/or use mathematical representations to support claims about the cycling of matter and flow of energy among organisms in an ecosystem; and use evidence and reasoning to construct an explanation for how interactions with biotic | Evaluate and revise a mathematical model that can explain that the cycling of matter and flow of energy among organisms in an ecosystem can be disturbed when a new variable is introduced; use mathematical and computational evidence to |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
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| | help maintain the population and diversity of organisms. | biotic and abiotic factors in maintaining the population and diversity of organisms in an ecosystem; and identify biological, physical, or human-induced disturbances. | and abiotic factors in ecosystems maintain the population and diversity of organisms, but that biological, physical, or human-induced disturbances in conditions may result in a new ecosystem. | argue that interactions with biotic and abiotic factors in ecosystems maintain the population and diversity of organisms; and predict how an ecosystem might change with a biological, physical, or human-induced disturbance in conditions. |
| LS3: Heredity: Inheritance and Variation of Traits | Identify relationships between DNA, chromosomes, and traits; and use graphical displays of data to identify evidence that supports a claim about genetic and environmental factors that may affect the variation and distribution of traits in a population. | Construct an explanation using empirical evidence of the relationship of DNA, chromosomes, and traits; and analyze data to support a claim defending an argument about genetic and environmental factors that may affect the variation and distribution of traits in a population. | Analyze an explanation or theory in order to determine the relationship between the role of DNA, chromosomes, and traits; and apply concepts of statistics and probability when analyzing evidence in order to make and defend a claim about genetic and environmental factors that may affect the variation and distribution of traits in a population. | Analyze and evaluate the relationship between the role of DNA, chromosomes, and traits; and apply concepts of statistics and probability when analyzing evidence in order to predict the variation and distribution of traits in a population when a genetic and environmental factor is changed. |
| LS4: Biological Evolution: Unity and Diversity | Identify and use genetic and anatomical evidence obtained from texts and mathematical representations to support that the evolution, extinction, and formation of new species is based on different environmental factors; and identify relationships of | Use graphical displays of data to provide genetic and anatomical evidence for how given factors have resulted in diversity through evolution, extinction, and formation of new species; and analyze data to support that environmental conditions can lead to adaptations within populations. | Use genetic and anatomical information obtained from texts and mathematical representations to construct an explanation for how given factors have resulted in diversity through evolution, extinction, and formation of new species; and analyze data to differentiate between causal and correlational | Use genetic and anatomical information obtained from texts and mathematical representations to evaluate and revise an explanation to predict what would happen to a current species when a given factor is changed; and predict which adaptations a population may experience |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|--|--|--|--|
| | environmental conditions and population adaptations. | | relationships within populations to support the argument that environmental conditions can lead to adaptations within populations. | when environmental conditions are changed. |
| Physical Sciences | | | | |
| PS1: Matter and Its Interactions | Recognize the patterns in the periodic table and identify components of the model that provide an explanation for the properties and characteristics of matter; and identify evidence for an explanation that any chemical process that occurs between matter is due to a collision of molecules, change in energy, and atomic configuration of the elements involved. | Use the periodic table as a model of atomic structure to complete simple computations and to provide an explanation for the properties and characteristics of matter; and identify evidence to support the claim that any chemical process that occurs between matter is due to a collision of molecules, change in energy, and atomic configuration of the elements involved. | Use the periodic table, subatomic structures, and corresponding electrical interactions to construct a model that explains the properties and characteristics of matter; and provide quantitative and qualitative evidence that any chemical processes that occur between matter are due to a collision of molecules, change in energy, and atomic configuration of the elements involved. | Use the periodic table, subatomic structures, and corresponding electrical interactions to evaluate and/or revise a mathematical model supported by evidence that predicts the properties and characteristics of matter when a component is changed; and construct and/or revise an explanation that any chemical processes that occur between matter are due to the collision of molecules, change in energy, and atomic configuration of elements. |
| PS2: Motion and Stability: Forces and Interactions | Identify the relationship between force and the distance between interacting objects or the relationship between force, mass, and acceleration; and interpret graphical displays of data to | Use the relationships between force and the distance between interacting objects or the relationship between force, mass, and acceleration; and use mathematical and graphical | Analyze data to support a claim that explains the relationship between force and the distance between interacting objects or the relationship between force, mass, and acceleration; and | Evaluate and revise a claim explaining the relationship between force and the distance between interacting objects or the relationship between force, mass, and acceleration; and use |

| Students who are at Level ____ may be able to do things like... | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|--|---|--|
| | identify evidence that supports how an object moves. | representations to describe the motion of an object. | use mathematical, graphical, and computational analysis to observe patterns to explain changes in the motion of an object. | scientific ideas, principles and/or evidence to revise an explanation and predict changes in the motion of an object when new information is introduced. |
| PS3 & PS4: Energy & Waves and Their Applications | Identify components of an investigation to describe how energy transfers within and between systems; and identify evidence supporting the relationship between wavelength, amplitude, and frequency, and that energy is not created nor destroyed but converted to other forms. | Collect and/or use mathematical data from an investigation to serve as the basis for a model that provides evidence of energy transfer within and between systems; and develop and/or use a model to support the relationship between wavelength, amplitude, and frequency, and that energy is not created nor destroyed but converted into other forms. | Develop and/or use a mathematical model, using collected or produced data from an investigation, to describe how energy transfers within and between systems; and provide data supporting the relationship between wavelength, amplitude, and frequency, and that energy is neither created nor destroyed but converted to other forms. | Evaluate and revise a mathematical model, using scientific ideas, principles, theories and/or newly added information or data, to predict how energy transfers within and between systems; and provide empirical data supporting the relationship between wavelength, amplitude, and frequency, and that energy is neither created nor destroyed but converted to other forms. |