A student performing at **Level 5 *exceeded expectations*** by demonstrating a *full and complete* understanding of grade appropriate Disciplinary Core Ideas (Life Science, Physical Science and Earth and Space Science), the Science and Engineering Practices, and the Crosscutting Concepts. The student ***consistently*** uses evidence to demonstrate a *full* understanding of grade appropriate Disciplinary Core Ideas. The student *consistently* applies the Science and Engineering Practices that mirror the practices of professional scientists and engineers to strengthen the skills in the practices and develop a *full* understanding of the nature of science and engineering. The student *consistently* demonstrates a *full* understanding of the correlation among the Crosscutting Concepts in order to make sense of and connect Disciplinary Core Ideas across disciplines

A student performing at level 5 can demonstrate the skills and knowledge of level 4 in addition to the following:

1. Apply scientific principles to construct an explanation of the outcome of chemical reactions based on the types, interactions, and motions of the atoms within it.
2. Evaluate data using mathematical and computational thinking and the expression F=ma to predict the changes in the motion of a single macroscopic object of a given mass due to the total force on it.
3. Create and refine computational models and devices both quantitatively and qualitatively to illustrate that the total energy available in a system and the concept of conservation of energy limits the behavior of the system.
4. Apply mathematical representations to distinguish between cause and correlation with respect to how wavelength, frequency and wave speed are related to one another, which depends on the type of wave and the medium in which the wave is traveling.
5. Analyze evidence to construct an explanation of how all cells contain genes which code for the formation of proteins, which have specific structures and functions that allows them to carry out the work of the cell.
6. Use mathematical and computational thinking to evaluate and revise explanations and models of interdependent relationships, ecological dynamics, and the cycling of matter and the flow of energy at one scale relates to another scale in an ecosystem.
7. Analyze scientific reasoning and evidence to evaluate and defend claims and explanations about the role of both genetic and environmental factors in creating the variation and distribution of traits in a population.
8. Evaluate the evidence to determine the merits of the claims that environmental conditions and the process of evolution are responsible for both the similarities of genetic material across all species and the biodiversity of species on Earth.
9. Use scientific reasoning to evaluate the limitations and strengths of the evidence for the Big Bang theory.
10. Evaluate and revise models that generate data to explain the complex and dynamic set of feedback interactions between Earth systems that are a result of energy flowing and matter cycling between these systems over a wide range of temporal and spatial scales.
11. Revise an investigation to improve the accuracy and precision of the data collected so it can be used as evidence to infer the effect of water on the processes in the natural world.
12. Evaluate data using computational models to explain the impact of human activity on relationships among Earth systems and the limitations in the models in predicting future changes and impacts.

A student performing at **Level 4 *met expectations*** by demonstrating a *general* understanding of grade appropriate Disciplinary Core Ideas (Life Science, Physical Science and Earth and Space Science), the Science and Engineering Practices, and the Crosscutting Concepts. The student *frequently* uses evidence to demonstrate a *general* understanding of grade appropriate Disciplinary Core Ideas of Life Science, Physical Science, and Earth and Space Science evident in the Performance Expectation. The student *frequently* applies the Science and Engineering Practices that mirror the practices of professional scientists and engineers to strengthen the skills in the practices and develop a *general* understanding of the nature of science and engineering. The student *frequently* demonstrates a *general* understanding of the correlation among the Crosscutting Concepts in order to make sense of and connect Disciplinary Core Ideas across disciplines.

A student performing at level 4 can demonstrate the skills and knowledge of level 3 in addition to the following:

1. Use the patterns in the periodic table to construct an explanation of the outcome of chemical reactions based on the types, interactions, and motions of the atoms within it.
2. Analyze data in order to make a scientific claim about how the expression F=ma predicts the changes in the motion of a single macroscopic object of a given mass due to the total force on it.
3. Evaluate and refine existing models and devices both quantitatively and qualitatively to illustrate that the total energy in a system only changes with the transfer of energy into or out of the system.
4. Use mathematical representations to support a claim with respect to how wavelength, frequency and wave speed are related to one another, which depends on the medium in which the wave is traveling.
5. Use evidence to construct an explanation of how all cells contain DNA which code for the formation of proteins, which carry out most of the work of cells to perform the essential functions of life.
6. Use mathematical and computational thinking to construct explanations and models of interdependent relationships, ecological dynamics, and the cycling of matter and the flow of energy at various scales in ecosystems.
7. Use scientific reasoning and evidence to defend claims about the role of DNA, chromosomes, and environmental factors in creating inheritable genetic variation in a population.
8. Construct an explanation based on evidence of how the process of evolution is responsible for both the similarities of genetic material across all species and the multitude of species existing in diverse conditions on Earth.
9. Use scientific reasoning and evidence from the Big Bang theory to explain current observations of the modern universe.
10. Develop models that generate data to explain the complex and dynamic set of feedback interactions between Earth systems that are a result of energy flowing and matter cycling between these systems.
11. Plan an investigation to produce data as evidence that the physical and chemical properties of water play a significant role in shaping Earth’s landscape.
12. Analyze data in computational models to explain the impact of human activity on relationships among Earth systems and its future impact on factors that affect climate.

A student performing at **Level 3 *approached expectations*** by demonstrating a *basic* understanding of grade appropriate Disciplinary Core Ideas (Life Science, Physical Science and Earth and Space Science), the Science and Engineering Practices, and the Crosscutting Concepts. The student *occasionally* uses evidence to demonstrate a *basic* understanding of grade appropriate Disciplinary Core Ideas of Life Science, Physical Science, and Earth and Space Science evident in the Performance Expectation. The student *occasionally* applies the Science and Engineering Practices that mirror the practices of professional scientists and engineers to strengthen the skills in the practices and develop a *basic* understanding of the nature of science and engineering. The student *occasionally* demonstrates a *basic* understanding of the correlation among the Crosscutting Concepts in order to make sense of and connect Disciplinary Core Ideas across disciplines

A student performing at level 3 can demonstrate the skills and knowledge of level 2 in addition to the following:

1. Use evidence to construct an explanation of the outcome of chemical reactions based on the types and motions of the atoms within it.
2. Analyze data with basic algebraic thinking to support the use of F=ma to predict the changes in the motion of a single macroscopic object of a given mass due to the total force on it.
3. Apply existing models and devices qualitatively to explain that the changes in energy in one component of a system affect the other parts of the system.
4. Use the data to show how wavelength, frequency and wave speed are related to one another, which depends on the medium in which the wave is traveling.
5. Make a relevant claim of how DNA determines protein structure and function, which creates specialized cells within an organism.
6. Use reasoning to support explanations and models of interdependent relationships, ecological dynamics, and the cycling of matter and the flow of energy in ecosystems.
7. Use evidence to construct explanations about the role of DNA, chromosomes, and environmental factors in creating inheritable genetic variation.
8. Use evidence to support an explanation about how the process of evolution is responsible for the multitude of species existing in diverse conditions on Earth.
9. Use evidence to support an explanation for the Big Bang theory.
10. Use models to identify interactions between Earth systems that are caused by variations in energy flowing or matter cycling between these systems.
11. Identify the evidence from an investigation to determine the relationship between the physical and chemical properties of water and their effect on Earth's landscape.
12. Use data to explain the impact of human activity on relationships among Earth systems.

A student performing at **Level 2 *partially met expectations*** by demonstrating a *minimal* understanding of grade appropriate Disciplinary Core Ideas (Life Science, Physical Science and Earth and Space Science), the Science and Engineering Practices, and the Crosscutting Concepts. The student *infrequently* uses evidence to demonstrate a *minimal* understanding of grade appropriate Disciplinary Core Ideas of Life Science, Physical Science, and Earth and Space Science evident in the Performance Expectation. The student *infrequently* applies the Science and Engineering Practices that mirror the practices of professional scientists and engineers to strengthen the skills in the practices and develop a *minimal* understanding of the nature of science and engineering. The student *infrequently* demonstrates a *minimal* understanding of the correlation among the Crosscutting Concepts in order to make sense of and connect Disciplinary Core Ideas across disciplines.

A student performing at level 2 can demonstrate the following skills and knowledge:

1. Revise an explanation of the outcome of chemical reactions based on the types of the atoms within it.
2. Use data to predict the changes in the motion of a single macroscopic object of a given mass due to the total force on it.
3. Use existing models and devices to explain that the transfer of energy can be accounted for as a combination of energy on both the macroscopic and microscopic scale.
4. Describe the relationship between frequency, wavelength and wave speed.
5. Make observations of how DNA determines protein structure and function.
6. Make observations about interdependent relationships, ecological dynamics, and the cycling of matter and flow of energy in ecosystems.
7. Identify evidence about the causes of inheritable genetic variation.
8. Make observations about how the process of evolution and environmental conditions affect genetic variation within populations.
9. Identify observations that support the Big Bang theory.
10. Use data to identify how changes to one Earth system results in changes in other systems.
11. Identify the physical and chemical properties of water that effect Earth’s landscape.
12. Identify the causes and impacts of global climate change.