Grade 8 Threshold Performance Level Descriptors Physical Science			
DCI	**Level 2**	**Level 3**	**Level 4**
PS1: Matter and Its Interactions	**Students should be able to demonstrate knowledge:**		
	• that everything is made from atoms and that the states of matter have some unique characteristics **AND** • that temperature and/or pressure have an effect on changes of state • that chemical reactions create new substances while the mass does not change, and energy is involved	• that substances are made from one or more types of atoms and that the particles in the states of matter have unique characteristics • that atoms are regrouped and conserved during chemical processes, and energy is either released or stored	• that substances can be made from two to thousands of atoms that can be combined in a variety of ways • that the same numbers of atoms are regrouped into different molecules to create new substances with different properties, and therefore, the mass does not change
PS2: Force and Motion	**Students should be able to demonstrate knowledge:**		
	• that the movement of an object is the sum of its forces • that forces among objects are either attractive or repulsive and are dependent upon the distance between the objects	• that in every interaction, there is a pair of forces acting on the two interacting objects and that the size of the forces on the first object equals the size of the forces on the second object • that the size of the electromagnetic force depends upon the magnitudes of the charges, currents, or magnetic strengths due to the fields created	• of the effect of balanced versus unbalanced forces on the motion of objects • that there is a relationship among forces, the fields created, and the magnitudes of the charges, currents, or magnetic strengths involved and among the distance between interacting objects and the masses of the interacting objects
PS3: Energy	**Students should be able to demonstrate knowledge:**		
	• to identify kinetic energy, potential energy, temperature, and heat • that if there is a change in motion energy, it is due to energy being transferred in or out of the system • to identify that, during a collision, energy is transferred, and both objects exert a force • to identify reactants needed to make food in plants and the products of cellular respiration	• of the proportional relationships that define kinetic and potential energy and the relationship between temperature and energy • of the relationship between energy and motion and how the amount of energy needed to cause changes is related to the properties of the substance • by describing the interaction between two objects in terms of force and energy transfer • to describe in general the processes of photosynthesis and cellular respiration including their reactants and products	• to explain the relationship among the variables for kinetic and potential energy and explain how temperature is affected by composition, state, and energy of the particles in the system • to explain the flow of energy in a system, the relationship between the properties of a substance, and the energy needed to change the temperature or motion of the particles • to explain why objects exert a force on each other and that energy is transferred during an interaction • to explain the relationship between photosynthesis and cellular respiration and predict effects of a change to the system

Grade 8 Threshold Performance Level Descriptors Physical Science			
DCI	**Level 2**	**Level 3**	**Level 4**
PS4: Waves and Their Applications in Technologies for Information Transfer	**Students should be able to demonstrate knowledge:**		
	• to identify properties of a simple wave • to identify the effect on a beam of light as it crosses between media and when it interacts with an object • to identify methods and their characteristics for transmitting information	• to describe the properties of a simple wave and how it moves • to describe the effect on light as it crosses between media, the path it follows, and its interaction with objects • by describing how digitized signals are a more reliable way to encode and transmit information than analog signals	• to explain the relationship between the properties of a wave and the requirement of a medium for transmission • by explaining how the properties of an object effect how light interacts with it and that the wave model of light is useful for explaining certain properties of light • to explain why digitized signals are a more reliable way to encode and transmit information than analog signals

Grade 8 Threshold Performance Level Descriptors Life Science			
DCI	**Level 2**	**Level 3**	**Level 4**
LS1: From Molecules to Organisms: Structures and Processes	**Students should be able to demonstrate knowledge:**		
	• that cells contain special structures which may be specific to the type of cell in a living unicellular or multicellular organism • of why genetic material is transferred differently in asexual reproduction and sexual reproduction, of how animal behaviors aid in reproduction for both the animal and/or some plants, and discuss genetic factors and local conditions that can affect growth of an organism • that matter and energy cycle through plants creating sugars, which can be broken down or rearranged to release the energy • that sense receptors can send various signals to the brain	• that cells are the smallest unit of life, that living organisms can consist of one or more cells, and that multicellular organisms often contain specialized systems working together and discuss the functions of special structures within cells • of characteristics, specialized features, and animal behaviors that increase the reproduction chance for both animals and plants and explain how growth is affected by both genetic and environmental factors • of the process of photosynthesis for the creation of food and of the fact that to use that food, it needs to be broken down through another series of chemical reactions • that nerves transmit sense receptor inputs to be processed in the brain, resulting in memories or responses	• of how parts of a cell function together in a manner similar to how systems interact in multicellular organisms • of characteristics, specialized features, and animal behaviors that increase the reproduction chance for both animals and plants and explain how growth is affected by both genetic and environmental factors • of the relationship between photosynthesis and cellular respiration and of how an organism obtains energy to sustain life • of the different ways a sense receptor reacts to inputs and of the process by which the signal is processed

Grade 8 Threshold Performance Level Descriptors Life Science			
DCI	**Level 2**	**Level 3**	**Level 4**
LS2: Ecosystems: Interactions, Energy, and Dynamics	**Students should be able to demonstrate knowledge:**		
	• that organisms are dependent on resources for which they may need to compete • that matter and/or energy are cycled through a food web of an ecosystem • that there are physical and biological components of ecosystems that changes to those will cause disruption, and that biodiversity is related to species representation and can be used to determine overall health of an ecosystem • that changes in biodiversity have an impact on humans	• of how growth and survival of an organism is dependent on access to limited resources and interactions with other organisms • of how matter and energy transfer between trophic levels • of the dynamic nature of ecosystems and of how biodiversity is used as a measure of an ecosystem's health • of how changing biodiversity can affect humans and the services humans rely on	• of an organism's reliance on the environment and of how populations are limited by access to resources, predatory interactions, and competition • of how a food web can model mechanisms for the cycling of matter, including the role of decomposers, which in turn account for the conservation of energy • of the relationship between biodiversity and ecosystem health and of the predicted outcomes of disturbances to an ecosystem • of why changes in biodiversity affect humans
LS3: Heredity: Inheritance and Variation of Traits	**Students should be able to demonstrate knowledge:**		
	• that genes are located on inherited chromosomes and that the gene may be slightly different from the parent's • that in sexual reproduction, each parent contributes half of the genetic material and that mutations that occur can be beneficial, harmful, or neutral	• that genes control production of proteins and that mutations cause genetic variation • about genetic contributions during sexual reproduction and the general effects that mutations cause	• of how genes control protein production and of what effect mutations could have on this process • of why individuals have two of each chromosome and how mutations may result in structural and functional changes

Grade 8 Threshold Performance Level Descriptors Life Science			
DCI	**Level 2**	**Level 3**	**Level 4**
LS4: Heredity: Biological Evolution: Unity and Diversity	**Students should be able to demonstrate knowledge:**		
	• that fossils can show the evolutionary progression of organisms living today, that organisms may be artificially selected for reproduction based on desired traits, and that while embryos across species may have similarities as they develop, the organisms with more advantageous traits are more likely to survive • that environmental conditions will drive trait commonality in species	• of the uses for the fossil record and of embryological development, including similarities not evident in the fully formed anatomy, where certain traits, whether natural or artificially selected, will provide advantages for survival • of how environmental conditions can change a species over generations and of how distributions of traits reflect adaptation by natural selection	• of evolutionary history based on anatomical similarities and to predict predominance of certain traits in a population • to predict trait distribution in a species based on changing environmental conditions

Grade 8 Threshold Performance Level Descriptors Earth and Space Science			
DCI	**Level 2**	**Level 3**	**Level 4**
ESS1: Earth's Place in the Universe	**Students should be able to demonstrate knowledge:**		
	• that the celestial bodies have observable patterns and that we exist in a galaxy called the Milky Way • that gravity acts on objects, that there are eclipses, and that Earth's tilt causes seasons • that fossils are used to date rock layers and that tectonic processes change Earth	• to predict the observed motion of the Sun, Moon, and stars • that gravity is an attractive force, that alignment of the Earth-Moon-Sun causes solar and lunar eclipses, and that changes in seasons are due to intensity of sunlight • that Earth's history can be determined from rock layers and that tectonic processes create and destroy Earth materials	• to explain the predictable observed patterns of the Sun, Moon, and stars • to predict eclipses and seasonal changes based on data or models • that rock layers and fossils only provide relative dates and that the sea floor has different ages

Grade 8 Threshold Performance Level Descriptors Earth and Space Science			
DCI	**Level 2**	**Level 3**	**Level 4**
ESS2: Earth's Systems	**Students should be able to demonstrate knowledge:**		
	• of where Earth's energy comes from and that Earth processes vary in timeframe and size • that Earth's plates move in different ways • that water cycles in Earth's spheres and affects weather patterns, that ocean water density varies, and that moving water affects landforms • that both living and nonliving factors influence complex weather patterns	• that energy and matter have caused, and continue to cause, changes on Earth • that rocks and fossils help determine how Earth's plates have moved • of the way that water cycles, of the factors that affect the movement of water in Earth's spheres, of the causes of ocean density differences, and of the way that moving water affects landforms • of how weather patterns are influenced by living and nonliving factors that vary with location and of how the ocean is a major driving factor	• of the interaction between Earth's processes driven by differing energy sources to explain Earth's history or predict future geological events • to predict effects of plate movement on Earth's landscape • to predict weather patterns that are the result of the cycling of water and of impacts of density on ocean currents • to predict the effect living and nonliving factors, including the ocean, have on weather and climate
ESS3: Earth and Human Activity	**Students should be able to demonstrate knowledge:**		
	• that resources are not evenly distributed • that natural hazards can be mapped • that human populations may negatively impact resources and that human activity has both positive and negative impacts on different organisms • of climate science and of the fact that human activities have an effect on global temperatures	• that there are renewable and non-renewable resources • that mapping hazards can help understand geological forces • on how humans have altered the biosphere and that humans are making technological gains to minimize negative impacts • of how human activities affect temperatures and that climate science may help lead to decisions to benefit life on Earth	• of the relationship of past geological processes and the distribution of resources • to predict future hazards based on historical occurrences • to predict whether human activities would be positive or negative and to evaluate solutions based on the rate of resource consumption • to predict when human activities will have significant impacts on the Earth's climate

Grade 8 SEP Threshold Performance Level Descriptors			
SEP	**Level 2**	**Level 3**	**Level 4**
Analyzing and Interpreting Data (AID):	**Students should be able to:**		
Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.	• identify and/or interpret data, graphical displays, and/or concepts of statistics and/or their limitations to provide evidence for phenomena	• analyze, interpret, and/or use simple data sets and/or concepts of statistics to identify relationships and/or define operational ranges for objects, processes, and/or systems	• analyze and interpret complex or multiple data sets and/or construct graphical displays to identify and/or explain relationships, limitations of data, when to use concepts of statistics, and/or to justify operational ranges for objects, processes, and/or systems
Asking Questions (for science) and Defining Problems (for engineering) (AQDP):	**Students should be able to:**		
A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.	• identify questions that arise from observations and models in order to clarify information and/or arguments, refine models, and/or determine relationships	• ask testable questions that arise from observations of phenomena, models, and/or unexpected results in order to clarify information, evidence, arguments, and/or design problems that can be solved through development of objects/tools, processes, and/or systems	• analyze and/or evaluate testable questions that arise from observations of phenomena, models, and/or unexpected results in order to clarify information, evidence, arguments, and/or design problems that can be solved through development of objects/tools, processes, and/or systems
Constructing Explanations (for science) and Designing Solutions (for engineering) (CEDS):	**Students should be able to:**		
The products of science are explanations and the products of engineering are solutions.	• identify or revise an explanation and/or design project based on models or representations or by applying scientific reasoning and/or evidence	• construct, revise, and/or use an explanation based on models or representations or by applying scientific reasoning and/or evidence or by undertaking a design project to construct and/or implement a solution	• analyze, construct, and/or elaborate on an explanation based on models or representations by applying scientific reasoning and/or evidence or by evaluating a design project to construct and/or implement solutions and/or optimize performance
Developing and Using Models (DUM):	**Students should be able to:**		
A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.	• use a simple model to show relationships, make predictions, or generate data and/or describe its limitations	• develop and/or revise a simple model to show relationships, make predictions, or generate data and/or evaluate its limitations	• develop, revise, and/or evaluate a complex model to show relationships, make predictions, or generate data and/or evaluate its merits and limitations

Grade 8 SEP Threshold Performance Level Descriptors			
SEP	**Level 2**	**Level 3**	**Level 4**
Engaging in Argument from Evidence (EAE):	**Students should be able to:**		
Argumentation is the process by which explanations and solutions are reached.	• identify evidence in arguments to support or refute explanations, • provide critiques of procedures or models, and/or • identify competing design solutions	• identify and/or compare multiple pieces of evidence in arguments, • provide critiques about explanations or questions, and/or • write arguments that support or refute the advertised performance of a device, process, or system	• critique arguments, procedures, or models, • construct and/or use written arguments to support or refute explanations, models, and/or solutions, or • analyze empirical evidence to support written arguments
Obtaining, Evaluating, and Communicating Information (OEIC):	**Students should be able to:**		
Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.	• read and use information from multiple simple scientific sources to describe patterns, clarify claims, and/or assess accuracy	• integrate information from multiple, complex, qualitative sources to clarify claims, assess accuracy, and evaluate conclusions	• integrate information from multiple, complex, quantitative sources to describe patterns, clarify claims, assess accuracy, and evaluate conclusions
Planning and Carrying Out Investigations (PACI):	**Students should be able to:**		
Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.	• plan and/or conduct an investigation that includes the identification of appropriate tools and methods for collecting data in order to provide evidence or test a design solution	• plan an investigation that includes the identification of variables and/or controls or indicates how much data is sufficient to serve as evidence or necessary to test a design solution, or evaluate an experimental design	• plan and refine an investigation that includes the identification of variables and controls, tools, how data will be collected, and how much data is sufficient to serve as evidence or necessary to test a design solution, or revise an experimental design
Using Mathematics and Computational Thinking (UMCT):	**Students should be able to:**		
In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships.	• identify qualitative and quantitative data and/or when the use of digital tools is warranted, • select appropriate mathematical representations, and • use algorithms to solve problems and/or address engineering questions	• decide whether to use qualitative or quantitative data, • use digital tools to analyze large data sets, • use mathematical representations, • explain and/or evaluate algorithms or mathematical concepts for solving problems and/or addressing engineering questions	• explain when to use qualitative or quantitative data, • evaluate digital tools, • explain mathematical representations, and/or • create algorithms to solve problems and/or address engineering questions