***General MCAS Achievement Level Descriptors***

**Exceeding Expectations**   
A student who performed at this level exceeded grade-level expectations by demonstrating mastery of the subject matter.

**Meeting Expectations**   
A student who performed at this level met grade-level expectations and is academically on-track to succeed in the current grade in this subject.

**Partially Meeting Expectations**A student who performed at this level partially met grade-level expectations in this subject. The school, in consultation with the student’s parent/guardian, should consider whether the student needs additional academic assistance to succeed in this subject.

**Not Meeting Expectations**A student who performed at this level did not meet grade-level expectations in this subject. The school, in consultation with the student’s parent/guardian, should determine the coordinated academic assistance and/or additional instruction the student needs to succeed in this subject.

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations, Meeting Expectations, Partially Meeting Expectations,* and *Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

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|  | | **Partially Meeting Expectations  *On MCAS, a student at this level:*** | | **Meeting Expectations  *On MCAS, a student at this level:*** | **Exceeding Expectations  *On MCAS, a student at this level:*** | |
| **Understanding and Application of Disciplinary Core Ideas** | | Demonstrates a partial understanding of some scientific concepts and processes by identifying and sometimes describing or providing evidence for these concepts and processes.  Uses some basic scientific terms in common scientific examples. | | Demonstrates a solid understanding of many scientific concepts and processes by mostly describing, explaining, and providing evidence for these concepts and processes.  Mostly applies appropriate scientific terms in a variety of applications, including common science examples and some novel situations. | Demonstrates a comprehensive, in-depth understanding of many scientific concepts and processes by consistently describing, explaining, and providing evidence for these concepts and processes.  Consistently applies scientific terms in appropriate contexts in both common science examples and many novel situations. | |
| **Understanding and Application of Scientific and Engineering Practices** | | Identifies a testable, scientific question for an investigation.  Completes a simple, commonly used model.  Uses simple graphs or data to draw general conclusions about a familiar scientific investigation or phenomena.  Identifies evidence to support a claim.  Describes a benefit or drawback of simple design features given a familiar device or prototype. | | Develops some testable, scientific questions for an investigation.  Completes or uses a model and describes some strengths and weaknesses of the model.  Analyzes multiple sources of data, including graphs and tables, to draw conclusions about a familiar scientific investigation or phenomena.  Provides some evidence to support a claim and constructs basic explanations for scientific phenomena or results from an investigation.  Analyzes design features of a familiar device or prototype and describes a benefit or drawback of the design. | Consistently develops testable, scientific questions for an investigation.  Creates a model, consistently describes the strengths and weaknesses of the model, and provides information for how to improve the model.  Analyzes multiple sources of data, including graphs and tables, to draw conclusions about a novel or complex scientific investigation or phenomena.  Provides several pieces of evidence to support a claim and constructs thorough explanations for scientific phenomena or results from an investigation.  Analyzes design features of a novel device or prototype and constructs an explanation for how the design features meet criteria for success or are limited by constraints. | |
| **Earth and Space Science** | **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | | **Meeting Expectations**  ***On MCAS, a student at this level:*** | | | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| **ESS1. Earth’s Place in the Universe** | Completes a model of the Earth-Sun-Moon system to show either a solar or a lunar eclipse.  Identifies the basic pattern of the moon phases.  Recognizes that the tilt of Earth’s axis causes the seasons.  Recognizes that gravity affects high and low tides, Earth’s orbit, and the Moon’s orbit.  Recognizes that the Milky Way galaxy contains many solar systems and that Earth is one planet within our solar system.  Identifies the bottom layer of rock as the oldest and the top layer of rock as the youngest.  Identifies some of the processes that play a role in the formation of rock. | | Develops a model showing the positions of the Sun, the Moon, and Earth during a solar or a lunar eclipse.  Completes a model of the moon phases.  Compares the intensity of sunlight at different locations on Earth during different seasons of the year.  Analyzes models to determine where high and low tides occur based on the position of the Moon.  Describes the role that gravity plays in orbital motions.  Orders the planets, our solar system, the Milky Way galaxy, and the universe by their relative sizes.  Analyzes a model showing several layers of rock containing fossils to draw conclusions about the relative ages of the fossils.  Uses rock layers and fossil evidence to describe how the geology of a particular area has changed over time, such as from a sea floor to a forest. | | | Constructs an explanation for why people see solar and lunar eclipses on Earth.  Constructs an explanation for why people on Earth observe the phases of the Moon.  Analyzes a graph to describe how changes in the duration and intensity of sunlight during a year determines the seasons. Supports conclusions with evidence from the graph.  Completes models showing where high and low tides occur and explains why there are high and low tides in these locations.  Compares and draws conclusions about the force of gravity on planets, moons, asteroids, comets, etc. in our solar system.  Analyzes a model showing several layers of rock containing a fault to draw a conclusion about the relative age of the fault.  Constructs an explanation for how rock layers and geologic structures, such as canyons, volcanoes, mountains, and beaches, are formed through weathering, erosion, heat, pressure, and/or deposition. |
| **ESS2. Earth’s Systems** | Uses a model to show that geologic structures, such as volcanoes and mountain ranges, are formed where plates are pushed together.  Recognizes that surface structures continue to change over time due to geologic processes, such as weathering, erosion, glaciation, and the movement of Earth’s plates.  Completes a model showing the primary steps of the water cycle.  Analyzes weather data and draws simple conclusions about the precipitation and temperature of an area.  Recognizes that temperatures near the ocean are more stable than temperatures of inland locations. | | Uses a model to describe the role of convection currents in the movement of Earth’s plates and identifies where convection currents occur.  Describes how geologic processes form and shape geologic structures, such as mid-ocean ridges, mountains, and volcanoes, and cause geologic events, including earthquakes, landslides, and volcanic eruptions.  Analyzes maps and other evidence to draw conclusions about the movement of Earth’s plates.  Describes the role of solar energy and gravity in the water cycle.  Describes the weather conditions that typically occur when cool and warm air masses collide. | | | Constructs an explanation for how the movement of Earth’s plates causes various geologic events, such as earthquakes, volcanic eruptions, and tsunamis.  Uses data to explain the relative time scales different geologic structures form over.  Supports a claim about the movement of Earth’s plates using several pieces of evidence, such as the shapes of continents and the locations of specific fossils and types of rock.  Describes evidence that glaciers were once present in an area.  Constructs an explanation for how each stage of the water cycle is dependent upon energy from the Sun and/or the Earth’s gravity.  Describes how air masses move and how the movement of air masses affects the weather in an area. |
| **ESS3. Earth and Human Activity** | Analyzes a basic map to draw general conclusions about the distribution of minerals or fossil fuels on Earth.  Identifies one way that humans can mitigate the impact of increases in human population on natural resources and the environment.  Analyzes a simple graph or data table to draw conclusions about how increased carbon dioxide levels in the atmosphere are affecting global temperatures. | | Provides a partial explanation for why some resources, such as fossil fuels, water, and mineral/ores, are unevenly distributed on Earth.  Describes various ways that humans can mitigate the overuse of Earth’s resources, such as using renewable energy sources, recycling, using public transportation, etc.  Constructs an explanation that human activities, such as fossil fuel combustion, agriculture, and deforestation, have played a role in rising global temperatures. | | | Explains why natural resources are unevenly distributed on Earth.  Analyzes data, including graphs and maps, to draw conclusions about how humans use natural resources and identifies some ways human can mitigate the overuse of these resources.  Analyzes data to describe how climate change is affecting an ecosystem.  Describes several ways humans can mitigate the effects of climate change. |

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| **Life Science** | **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| **LS1. From Molecules to Organisms: Structures and Processes** | Recognizes that animal, plant, and bacterial cells have some shared characteristics and some different characteristics.  Recognizes some parts of a cell and the function of some cell parts.  Describes two body systems and how they work together.  Identifies some behaviors and structures of plants and animals that enables them to survive and successfully reproduce.  Identifies a characteristic that is inherited and a characteristic that is mostly a result of the environment.  Recognizes that all organisms need an energy source and nutrients to survive. | Uses the characteristics of cells to categorize an organism as an animal, plant, or bacteria.  Given a diagram of a cell, identifies the cell parts and describes most functions of the cell parts.  Generally describes how different body systems work together.  Provides evidence for how some organisms are able survive and reproduce more than other organisms.  Analyzes information about an organism to determine which characteristics are inherited and which characteristics are mostly a result of the environment.  Describes how carbohydrates, proteins, and fats are broken down to support cell growth and to release energy (cellular respiration). | Compares animal, plant, and bacterial cells and identifies both similarities and differences between them.  Consistently describes the functions of cell parts.  Describes how the interactions between body systems can be affected by a condition or disease based on the functions of the body systems.  Expalins how various structures and behaviors can provide survival and reproductive advantages to plants and animals.  Uses evidence to explain why some characteristics are inherited and other characteristics are a result of both inheritance and the environment.  Using a model, explains how food molecules are broken down and rearranged to provide nutrients for cell growth and energy for cellular processes. |
| **LS2. Ecosystems: Interactions, Energy, and Dynamics** | Interprets graphs to determine whether the size of a population increased, decreased, or stayed the same.  Identifies one ecological relationship (competitive, predator-prey, parasitic, or mutually beneficial) when given a description of the interaction of two organisms.  Recognizes that the biodiversity of a population is positively correlated with its size.  Identifies how an ecosystem and how an organism living in the ecosystem can be helped by a human action. | Analyzes population data, including graphs, to describe changes in the size of a particular population over time.  Identifies several ecological relationships when given the interactions of organisms in an environment (including analyzing a food web).  Completes models to show the cycling of matter through photosynthesis, cellular respiration, and decomposition.  Uses a model of an ecosystem to describe how a disruption to the ecosystem can have an effect on an organism in the ecosystem.  Describes multiple ways how the biodiversity of a population can be increased.  Describes several ways an ecosystem and the organisms living in the ecosystem can be helped by human actions. | Constructs an explanation for the reasons why populations grow versus decline over time.  Analyzes a complex food web and describes the ecological roles of the organisms. Consistently describes the roles of producers, primary, secondary, and tertiary consumers, and decomposers in a model.  Develops a model to show the cycling of matter and energy through an ecosystem, including the role of photosynthesis, cellular respiration, and decomposition.  Uses a model of an ecosystem to construct an explanation with evidence for how a natural or manmade disruption to the environment can affect multiple populations in the ecosystem.  Evaluates competing designs for protecting an ecosystem and its inhabitants from threats such as climate change, habitat loss, pollution, or overharvesting of resources. |
| **LS3. Heredity: Inheritance and Variation of Traits** | Uses a model to show that chromosomes are made up of genetic information.  Identifies one benefit of sexual reproduction or one benefit of asexual reproduction.  Recognizes that offspring from sexual reproduction inherit genes from two parents.  Recognizes that differences in inherited genes can lead to different traits.  Analyzes a simple Punnett square to determine the expected percentage of offspring with a certain trait. | Completes a model to show that chromosomes contain genes and genes contain the instructions for proteins.  Describes mutations as changes to genes. Identifies examples of mutations that are harmful, beneficial, or neutral to an organism.  Describes some of the benefits and drawbacks of sexual versus asexual reproduction.  Completes a Punnett square to determine the expected percentage of offspring that will inherit certain genotypes (allele pairs) and phenotypes (traits). | Develops a model to show that chromosomes are made up of genes and that genes contain the instructions for proteins, which determine the inherited characteristics of an organism.  Describes how a mutation may be harmful, neutral, or beneficial to an organism depending on its interactions with the environment.  Constructs an explanation for why some organisms benefit from asexual reproduction while other organisms benefit from sexual reproduction.  Develops a model to show that sexual reproduction results in a set of chromosomes (found in the nucleus) from each parent, and therefore an allele for each gene is inherited from each parent. |
| **LS4. Biological Evolution: Unity and Diversity** | Analyzes fossil evidence to draw conclusions about different organisms living at different times.  Compares a structure in a living organism to a structure from a fossilized organism and draws a conclusion about their similarity.  Recognizes that individuals with certain inherited characteristics have a higher probability of surviving than individuals without those characteristics.  Identifies one difference between natural selection and artificial selection. | Analyzes fossil evidence to describe how the environment in an area has changed over geologic time.  Explains how living and fossilized organisms can have similar body structures with similar or different functions.  Identifies examples of natural selection and generally explains why they are examples of natural selection.  Compares examples of natural selection and artificial selection. | Constructs an explanation using fossil evidence for how similar structures can be used to infer whether two types of organisms share a recent common ancestor.  Constructs an explanation for how a trait can become more common in a population over time due to natural selection.  Describes advantages and disadvantages of both natural and artificial selection. |

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| **Physical Science** | **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| **PS1. Matter and Its Interactions** | Identifies that all living and non-living things are made-up of atoms.  Identifies that mixtures can be separated by physical means.  Using data, identifies one piece of evidence that a chemical reaction or a physical change occurred.  Interprets a particle model to determine the three states of matter shown in the model.  Recognizes that a new substance is formed when a chemical reaction occurs.  Given data, determines if energy is being absorbed or released in a chemical reaction.  Calculates the density of an object given its mass and volume. | Completes a model showing how atoms form compounds and molecules.  Describes how mixtures are made up of pure substances that can be separated by physical means.  Using data, identifies multiple pieces of evidence that a chemical reaction or a physical change occurred.  Partially describes how particle motion, spatial arrangement, or temperature of a substance change when thermal energy is added to or removed from the substance.  Completes a bar graph to show that there is conservation of mass in a chemical reaction or a physical change.  Given a chemical reaction, identifies if it is exothermic or endothermic based on whether or not thermal energy is released or absorbed.  Describes, compares, and calculates the densities of different materials. | Analyzes a chemical formula to determine the number of each type of atom that makes up a given molecule.  Analyzes data to determine which substances are pure substances.  Explains the difference between a chemical reaction and a physical change and provides multiple pieces of evidence to support the explanation.  Consistently describes how particle motion, spatial arrangement, and temperature of a substance change when thermal energy is added to or removed from the substance.  Relates the temperature of a substance to the average kinetic energy of the molecules in the substance and recognizes that temperature and average molecular kinetic energy do not change as a substance changes state.  Uses evidence from an investigation to support a claim that matter is not created or destroyed during a chemical reaction or a physical change.  Describes the difference between an endothermic and exothermic reaction. Supports the description with evidence from a chemical reaction.  Determines whether an object would float or sink in water due its density and supports the answer with evidence. |
| **PS2. Motion and Stability: Forces and Interactions** | Given a model, recognizes that an object that applies a force to another object will also experience a force acting on it.  Compares the change in speed of two objects that have different masses, when the same net force is acting on each object.  .  Recognizes that the speed of an object will change if the forces acting on the object are not balanced.  Recognizes that two positive charges or two negative charges will repel each other, and a negative charge and a positive charge will attract each other.  Completes a model to show that gravitational forces are attractive.  Using a model, describes how an object can exert a force on another object, even when the objects are not in contact with each other. | Analyzes models to draw conclusions about the forces acting on objects during a collision.  Completes a graph to show how the change in speed of an object depends on the mass of the object, when a constant net force is acting on the object.  Completes a model to show whether the speed of an object will increase, decrease, or remain constant based on the forces acting on an object.  Completes a model to show how the distance between two electric charges or the magnitudes of the charges affects the strength of the forces between the charges.  Describes how the masses of objects affects the gravitational forces between the objects.  Completes a model of the electric, magnetic, or gravitational field around an object. | Develops models to show the forces acting on objects before, during, and after a collision.  Develops a model to show how the change in speed of an object depends on the mass of the object and the net force acting on the object.  Uses data to construct an explanation about how the distance between two electric charges or the magnitudes of the charges affects the strength of the force between the charges.  Develops a model showing the relative magnitudes of gravitational forces acting between two objects.  Completes a model of the electric, magnetic, or gravitational field between two objects. |
| **PS3. Energy** | Interprets a graph to show how the kinetic energy of an object relates to the speed of the object, or vice versa.  Interprets data to describe what will happen to an object’s kinetic energy as its potential energy decreases.  Identifies the flow of thermal energy from hot to cold.  Identifies an example of conduction, radiation, or convection.  Describes how it takes more time to heat an object that has more mass than an object (of the same material) with less mass.  Using a graph, determines how an increase in average kinetic energy of an object results in an increase in temperature. | Completes a graph to show how the kinetic energy of an object relates to the speed of the object, or vice versa.  Analyzes information, including graphics and data, and generally describes how the kinetic and potential energies of an object compare at different heights, when energy is conserved.  Analyzes the conversions of different types of potential energy into kinetic energy, and vice versa, to draw conclusions about energy conservation.  Generally describes how thermal energy is transferred through conduction, radiation, and convection and generally describes ways this heat flow can be increased or decreased in a given situation.  Analyzes data and draws conclusions about how certain materials are better thermal conductors than others.  Describes how average kinetic energy is related to temperature. | Uses a graph to show how the kinetic energy of an object relates to the speed of the object, or vice versa, and explains the reasoning.  Analyzes information, including graphics and data, and consistently describes how the kinetic and potential energies of an object compare at different heights, and is able to explain that energy is conserved.  Explains how different types of potential energies are converted to kinetic energy and vice versa.  Explains how thermal energy is transferred through conduction, radiation, and convection and fully describes ways the rate of this heat flow can be increased or decreased in a given situation.  Constructs an explanation to show the relationships among the amount of energy transferred between objects, how well materials of the objects retain or radiate heat, the masses of the objects, and the changes in the average kinetic energies of the objects’ materials. |
| **PS4. Waves and Their Applications in Technologies for Information Transfer** | Completes a model of a wave to show its frequency, amplitude, or wavelength.  Given a model, sometimes identifies where waves are reflected, absorbed, or transmitted through a material.  Identifies when a signal is either encoded or transmitted. | Compares two waves’ frequencies, amplitudes, and wavelengths, and sometimes describes how these characteristics will affect the waves.  Recognizes that the energy of a wave changes if the amplitude of the wave changes.  Completes a model showing reflection, absorption, and transmission of a wave, including where waves are refracted.  Describes the processes of encoding and transmitting. | Compares two waves’ frequencies, amplitudes, and wavelengths, and consistently describes how these characteristics will affect the pattern of a wave.  Compares the energy of two waves with the same frequency and different amplitudes.  Develops a model to explain how waves are reflected, absorbed, or transmitted in a given situation, including how waves are refracted. |

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| **Technology/ Engineering** | **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| **ETS1. Engineering Design** | Identifies criteria and constraints of a design problem. Identifies one solution to a simple problem.  Uses a simple design matrix to determine the best solution.  Sometimes solves simple scale problems, given the actual measurement or the scaled measurement.  Analyzes a design feature of a prototype and identifies the importance of a prototype. | Describes some criteria and constraints of a design problem. Describes a solution to a problem and explains how it could be successful based on evidence.  Uses a design matrix to draw conclusions about possible solutions.  Solves scale problems, given the actual measurement or the scaled measurement.  Generally describes appropriate design features of a prototype and describes the importance of a prototype. | Describes several criteria and constraints of a design problem. Describes several solutions to a problem and explains their limitations and benefits based on evidence.  Uses a design matrix to draw conclusions about possible solutions and explains the reasoning.  Explains when a scale drawing should be used, and determines an appropriate scale for a given situation.  Consistently describes appropriate design features of prototypes for a given situation. |
| **ETS2. Materials, Tools, and Manufacturing** | Recognizes basic properties of common materials (such as wood, metal, and plastic).  Uses data about material characteistics to choose a material appropriate for a given design problem.  Given a set of tools, chooses the best tool for a given task.  Identifies and describes some of the manufacturing processes (forming, separating, conditioning, assembling, finishing, quality control, and safety).  Identifies an advantage or a disadvantage of using a computer or a human for a given task. | Describes properties (such as flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point) of common materials and generally uses the materials for appropriate design solutions.  Describes the best tools to use for a given situation.  Generally describes a few steps of the manufacturing process in a given situation.  Provides an advantage and a disadvantage of using a computer or a human for a given task. | Evaluates different materials and determines the best materials to use for a given design problem. Explains the reasoning, giving both drawbacks and benefits of the materials.  Consistently describes several steps of the manufacturing process in a given situation.  Provides multiple advantages and/or disadvantages of using a computer or a human for a given task. |
| **ETS3. Technological Systems** | Identifies and describes the functions of some components of a communication system (source, encoder, transmitter, receiver, decoder, and storage).  Given a diagram, identifies and describes some of the functions of some components of a vehicle (structural, propulsion, guidance, suspension, and control subsystems).  Given a diagram, identifies and describes some of the parts of a structural system (foundation, decking, wall, and roofing).  Given a diagram, identifies a force (tension, torsion, compression, and shear) acting on a structure.  Given a transportation, structural, or communication system, identifies some of the components of an engineering system: inputs, processes, outputs, and feedback. | Completes a model and describes the functions of several components of a communication system.  Completes a model and describes most of the functions of some components of a vehicle.  Identifies and describes most of the parts of a given structural system.  Identifies and describes two forces acting on a shown structure. Identifies live and dead loads for a given scenario.  Given a transportation, structural, or communication system, identifies and describes several components of an engineering system. | Develops a model and describes the functions of the components of a communication system.  Develops a model and describes most of the functions of the components of a transportation system.  Consistently identifies and describes the parts of a given structural system.  Consistently identifies and describes forces acting on a shown structure. Describes live and dead loads for a given scenario.    Given a transportation, structural, or communication system, consistently identifies and describes components of an engineering system. |