Grade Eight Range Achievement Level Descriptors for the California Science Test

California Assessment of Student Performance and Progress

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Measuring the Power of Learning.™

Three-Dimensional (3-D) Earth and Space Sciences

Earth and Space Sciences: DCI Strands	Nearly Met Standard Students at level 2 **consistently** apply their knowledge and skills of the CA NGSS to problems of **low complexity**, demonstrating a **partial understanding** of the earth and space sciences.	Met Standard Students at level 3 **consistently** apply their knowledge and skills of the CA NGSS to problems of **medium complexity**, demonstrating an **adequate understanding** of the earth and space sciences.	Exceeded Standard Students at level 4 **consistently** apply their knowledge and skills of the CA NGSS to problems of **high complexity**, demonstrating a **thorough understanding** of the earth and space sciences.
Earth's Place in the Universe (ESS1)	Students can **use a model** of the Earth-sun-moon system to identify the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons; **use a model to identify** the motions of objects within galaxies and the solar system; **use data to describe** scale properties of objects in the solar system; and **use** rock strata to describe the order of geologic time scale events.	Students can **develop and use a model** of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons; **develop and use a physical model to describe** the role of gravity in the motions within galaxies and the solar system; **analyze and interpret data to determine** scale properties of objects in the solar system; and **construct a scientific explanation** based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	Students can **develop a model** of the Earth-sun-moon system to predict the occurrence of lunar phases, eclipses of the sun and moon, and seasons; **develop and use a conceptual model to explain** the role of gravity in the motions within galaxies and the solar system; **analyze and interpret data to predict** patterns of scale properties of objects in the solar system; and **construct a scientific explanation** based on evidence from rock strata, the fossil record, and geologic events to organize Earth's 4.6-billion-year-old history.

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Earth's Systems (ESS2)	Students can **use a model to describe** the cycling of Earth's materials and the flow of energy that drives this process; **describe** that geoscience processes have changed Earth's surface; **use data** on the distribution of fossils and rocks, continental shapes, and seafloor structures to describe past plate motions; **use a model to describe** the cycling of water through Earth's systems driven by energy from the sun and the force of gravity; **describe** that the motions and interactions of air masses cause changes in weather conditions; and **use a model to describe** how unequal heating and the rotation of Earth can affect regional climates.	Students can **develop a model to describe** the cycling of Earth's materials and the flow of energy that drives this process; **construct an explanation** based on evidence for how geoscience processes have changed Earth's surface; **analyze and interpret data** on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past tectonic plate motions; **develop a model to describe** that the cycling of water through Earth's systems is driven by energy from the sun and the force of gravity; **use evidence to explain** how the motions and interactions of air masses cause changes in weather conditions; and **develop and use a model to describe** how unequal heating and the rotation of Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	Students can **develop a model to explain** the cycling of Earth's materials and the flow of energy that drives this process; **construct an explanation** based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales; **analyze and interpret data to identify patterns** in the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past tectonic plate motions; **develop a model to explain** how the cycling of water through Earth's systems is driven by energy from the sun and the force of gravity; **use evidence to predict** changing weather conditions using the motions and interactions of air masses; and **develop and use a model to explain** how unequal heating and the rotation of Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

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Earth and Human Activity (ESS3)	Students can **describe** how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of geological processes; **use data** on natural hazards to predict future catastrophic events and identify an example of a technology that mitigates their effects; **describe** an example of how humans monitor their impact on the environment; **describe** that increases in human population and per-capita consumption of natural resources can impact Earth's systems; and **make observations** about the factors that have caused the rise in global temperatures over the past century.	Students can **construct a scientific (i.e., based on theories and laws) explanation** based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of geological processes; **analyze and interpret data** on natural hazards to predict future catastrophic events and inform the development of technologies to mitigate their effects; **design a method** for monitoring and minimizing a human impact on the environment; **construct an argument** supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems; and **ask questions to clarify** evidence of the factors that have caused the rise in global temperatures over the past century.	Students can **construct a scientific (i.e., based on theories and laws) explanation** based on evidence of the cause and effect relationship between geological processes and the uneven distributions of Earth's mineral, energy, and groundwater resources; **analyze and interpret patterns in data** on natural hazards to predict future catastrophic events and inform the development of technologies to mitigate their effects; **design and evaluate a method** based on how well it meets the criteria and constraints for monitoring and minimizing a human impact on the environment; **construct an argument** supported by evidence for how the rates of change in human population and per-capita consumption of natural resources impact Earth's systems; and **ask and differentiate between testable and non-testable questions to clarify** evidence of the factors that have caused the rise in global temperatures over the past century.

3-D Life Sciences

Life Sciences: DCI Strands	Nearly Met Standard Students at level 2 **consistently** apply their knowledge and skills of the CA NGSS to problems of **low complexity**, demonstrating a **partial understanding** of the life sciences.	Met Standard Students at level 3 **consistently** apply their knowledge and skills of the CA NGSS to problems of **medium complexity**, demonstrating an **adequate understanding** of the life sciences.	Exceeded Standard Students at level 4 **consistently** apply their knowledge and skills of the CA NGSS to problems of **high complexity**, demonstrating a **thorough understanding** of the life sciences.
From Molecules to Organisms: Structures and Processes (LS1)	Students can **make observations** that living things are made of either one cell or different numbers and types of cells; **use a model to describe** the function of a cell as a whole and ways parts of cells contribute to the function; **identify** evidence that the body is a system of interacting subsystems composed of groups of cells; **identify** characteristic animal behaviors and specialized plant structures that affect the probability of successful reproduction of animals and plants; **describe** how environmental and genetic factors influence the growth of organisms; **describe** the role of photosynthesis in the cycling of matter or flow of energy into and out of organisms; **use a model to describe** that food is rearranged through chemical reactions forming new molecules that support growth and/or release energy; and **use information** regarding how sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	Students can **investigate** that living things are made of either one cell or different numbers and types of cells; **develop and use a model to describe** the function of a cell as a whole and ways parts of cells contribute to the function; **construct an argument** supported by evidence for how the body is a system of interacting subsystems composed of groups of cells; **construct an argument** to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants; **construct a scientific explanation** based on evidence for how environmental and genetic factors influence the growth of organisms; **construct a scientific explanation** based on evidence for the role of photosynthesis in the cycling of matter or flow of energy into and out of organisms; **develop a model to describe** that food is rearranged through chemical reactions forming new molecules that support growth and/or release energy; and **gather and synthesize information** that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	Students can **use evidence to plan an investigation** about living things being made of either one cell or different numbers and types of cells; **develop a model to explain** the function of a cell as a whole and ways parts of cells contribute to the function; **construct an argument** supported by evidence for how every scale of body function is composed of systems of interacting components; **construct an argument** to support an explanation of the cause and effect relationship between characteristic animal behaviors and specialized plant structures and the probability of successful reproduction of animals and plants; **construct a scientific explanation** based on evidence regarding the cause and effect relationship between environmental and genetic factors and the growth of organisms; **construct a scientific explanation** based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms; **develop and use a model to predict** how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy; and **evaluate information** describing the cause and effect relationship between a stimulus and a response by sensory receptors.

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Ecosystems: Interactions, Energy, and Dynamics (LS2)	Students can **identify** the effects of resource availability on organisms and populations of organisms in an ecosystem; **identify** interactions among organisms across multiple ecosystems; **use a model to identify** the cycling of matter and flow of energy among living and nonliving parts of an ecosystem; **describe** that changes to physical or biological components of an ecosystem affect populations; and **describe** a solution for maintaining biodiversity and ecosystem services (e.g. clean air, clean water, etc.).	Students can **analyze and interpret data to provide evidence** for the effects of resource availability on organisms and populations of organisms in an ecosystem; **construct an explanation that describes** patterns of interactions among organisms across multiple ecosystems; **develop a model to describe** the cycling of matter and flow of energy among living and nonliving parts of an ecosystem; **construct an argument** supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations; and **evaluate competing design solutions** for maintaining biodiversity and ecosystem services (e.g. clean air, clean water, etc.).	Students can **analyze and interpret data to identify** cause and effect relationships between resource availability and the organisms and populations of organisms in an ecosystem; **construct an explanation that predicts** patterns of cause and effect relationships among organisms across multiple ecosystems; **develop a model to explain** how matter cycles and energy flows among living and nonliving parts of an ecosystem; **construct an argument** supported by empirical evidence why small changes to physical or biological components of an ecosystem might lead to larger changes in populations; and **evaluate competing design solutions** based on how well they meet the criteria and constraints for maintaining biodiversity and ecosystem services (e.g. clean air, clean water, etc.).
Heredity: Inheritance and Variation of Traits (LS3)	Students can **use a model to describe** that mutations may affect proteins and may result in effects to the structure and function of the organism; and **use a model to describe** that asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Students can **develop and use a model to describe** that mutations may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism; and **develop and use a model to describe** that asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Students can **develop a model to explain** why mutations may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism; and **develop a model to explain** why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

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Biological Evolution: Unity and Diversity (LS4)	Students can **identify** patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth; **describe** the anatomical similarities and differences among modern organisms and between modern and fossil organisms; **use pictorial data** to compare patterns in the embryological development across multiple species to identify relationships; **describe** how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment; **identify** information about what technologies have changed the way humans influence the inheritance of desired traits in organisms; and **describe** how natural selection may lead to increases and decreases of specific traits in populations over time.	Students can **analyze and interpret data to identify** patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth; **construct an explanation** for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships; **analyze pictorial data** to compare patterns of similarities in the embryological development across multiple species to identify relationships; **construct an explanation** based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment; **gather and synthesize** information about how technologies have changed the way humans influence the inheritance of desired traits in organisms; and **use mathematical representations** to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	Students can **analyze and interpret data to identify** patterns of changes in levels of complexity of anatomical structure in the fossil record that document the existence, diversity, extinction, and chronological change of life forms throughout the history of life on Earth; **construct an explanation** for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer lines of evolutionary descent; **analyze pictorial data** to use patterns of similarities and changes in embryological development to describe evidence for relatedness among diverse species; **use proportional reasoning to construct an explanation** based on evidence that describes the cause and effect relationship between the genetic variations of traits in a population and the probability of an individual surviving and reproducing in a specific environment; **evaluate the credibility and accuracy of information** about how technologies have changed the way humans influence the inheritance of desired traits in organisms; and **use mathematical representations including probability and proportional reasoning** to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

3-D Physical Sciences

Physical Sciences: DCI Strands	Nearly Met Standard Students at level 2 **consistently** apply their knowledge and skills of the CA NGSS to problems of **low complexity**, demonstrating a **partial understanding** of the physical sciences.	Met Standard Students at level 3 **consistently** apply their knowledge and skills of the CA NGSS to problems of **medium complexity**, demonstrating an **adequate understanding** of the physical sciences.	Exceeded Standard Students at level 4 **consistently** apply their knowledge and skills of the CA NGSS to problems of **high complexity**, demonstrating a **thorough understanding** of the physical sciences.
Matter and Its Interactions (PS1)	Students can **use a model to identify** the atomic composition of simple molecules; **identify** properties of substances before and after their interaction; **identify** that synthetic materials come from natural resources and have an impact on society; **use a model to identify** changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed; **use a model to identify** how the total number of atoms does not change in a chemical reaction; and **make observations or take measurements** from a device that either releases or absorbs thermal energy by chemical processes.	Students can **develop a model to describe** the atomic composition of simple molecules and extended structures; **analyze and interpret data to provide evidence** of whether a chemical reaction has occurred; **gather information to describe** that synthetic materials come from natural resources and have an impact on society; **develop and use a model to describe** changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed; **develop a model to predict and describe** how the total number of atoms does not change in a chemical reaction; and **design and test** a device that either releases or absorbs thermal energy by chemical processes.	Students can **develop and use a model to predict** the atomic composition of molecules and extended structures; **analyze and interpret data to identify patterns** in the properties of substances before and after interaction to determine if chemical reactions have occurred; **synthesize information to describe** that synthetic materials come from natural resources and evaluate the impact on society; **develop and use a model to explain** the changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed; **develop a model to explain** the law of conservation of matter to predict and describe how a total number of atoms does not change in a chemical reaction; and **evaluate multiple solutions to a problem** based on how well they meet the criteria and constraints using a device that either releases or absorbs thermal energy by chemical processes.

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Motion and Stability: Forces and Interactions (PS2)	Students can use Newton's third law to **identify** a problem involving the motion of two colliding objects; **identify** that the change in an object's motion depends on the sum of the forces on the object or the mass of the object; **make observations** about the factors that affect the strength of electric and magnetic forces; **identify** that gravitational interactions are attractive and depend on the masses of interacting objects; and **identify** whether electric or magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.	Students can apply Newton's third law to **design a solution** to a problem involving the motion of two colliding objects; **investigate** how the change in an object's motion depends on the sum of the forces on the object and the mass of the object; **ask questions** to determine the factors that affect the strength of electric and magnetic forces; **construct arguments using evidence to support a claim** that gravitational interactions are attractive and depend on the masses of interacting objects; and **investigate** whether electric or magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.	Students can apply Newton's third law to **design and evaluate a solution** to a problem involving the motion of two colliding objects; **use evidence to plan an investigation** about how the change in an object's motion depends on the sum of the forces on the object and the mass of the object; **identify testable and non-testable questions** to determine the factors that affect the strength of electric and magnetic forces; **construct arguments using multiple sources of evidence to support a claim** that gravitational interactions are attractive and depend on the masses of interacting objects; and **evaluate the experimental design of an investigation** of whether electric or magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.

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Energy (PS3)	Students can **use** graphical displays of data to describe the relationship of kinetic energy to the mass and speed of an object; **use a model to describe** that when the positions of objects interacting at a distance changes, different amounts of potential energy are stored in the system; **describe** a device that either minimizes or maximizes thermal energy transfer; **identify** the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample; and **identify** evidence that when the kinetic energy of an object changes, energy is transferred to or from the object.	Students can **construct** graphical displays of data to describe the relationship of kinetic energy to the mass and speed of an object; **develop a model to describe** that when the positions of objects interacting at a distance changes, different amounts of potential energy are stored in the system; **apply scientific principles to design, construct, and test** a device that either minimizes or maximizes thermal energy transfer; **investigate** the relationships among energy transferred, type of matter, mass, and change in the average kinetic energy of the particles as measured by the temperature of the sample; and **construct an argument** to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	Students can **construct and/or analyze** graphical displays of data to describe the linear proportional relationship of kinetic energy to mass of an object and the nonlinear (square) proportional relationship of kinetic energy to the speed of an object; **develop a model to explain or predict** how potential energy stored in a system will change when the positions of objects interacting at a distance changes; **use scientific principles to refine a design solution based on a set of criteria and constraints** for a device that either minimizes or maximizes thermal energy transfer; **use evidence to plan an investigation** about the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample; and **construct an argument** to support the claim that energy takes different forms when energy is transferred to or from an object when the kinetic energy of the object changes.

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Waves and their Applications in Technologies for Information Transfer (PS4)	Students can **identify the components** of a simple wave model that includes how the amplitude of a wave is related to the energy in a wave; **use a model to describe** that waves are reflected, absorbed, or transmitted through various materials; and **use information to support the claim** that digitized signals are a more reliable way to encode and transmit information than analog signals.	Students can **use mathematical representations to describe** a simple wave model that includes how the amplitude of a wave is related to the energy in a wave; **develop and use a model to describe** that waves are reflected, absorbed, or transmitted through various materials; and **integrate qualitative scientific and technical information to support the claim** that digitized signals are a more reliable way to encode and transmit information than analog signals.	Students can **use mathematical representations to describe patterns** in a simple wave model that include that the energy of the wave is proportional to the square of the amplitude; **develop and use a model to predict** how waves are reflected, absorbed, or transmitted through various materials; and **integrate qualitative scientific and technical information to support the claim** that digitized signals are more reliable than analog by describing the structure and function of a specific technology that uses digital encoding.

3-D Engineering Technology and Applications of Science

Engineering, Technology, and Applications of Science: DCI Strand	Nearly Met Standard Students at level 2 consistently apply their knowledge and skills of the CA NGSS to problems of low complexity, demonstrating a partial understanding of engineering, technology, and applications of science.	Met Standard Students at level 3 consistently apply their knowledge and skills of the CA NGSS to problems of medium complexity, demonstrating an adequate understanding of engineering, technology, and applications of science.	Exceeded Standard Students at level 4 consistently apply their knowledge and skills of the CA NGSS to problems of high complexity, demonstrating a thorough understanding of engineering, technology, and applications of science.
Engineering Design (ETS1)	Students can **describe** a problem that needs to be solved using the design process; **describe** a design solution based on how well it meets the criteria and constraints of the problem; **use data** to compare several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success; and **use a model to generate** data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	Students can **define the criteria and constraints** of a design problem, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions; **compare** competing design solutions based on how well they meet the criteria and constraints of the problem; **analyze data from tests** to compare several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success; and **develop a model to generate** data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	Students can **evaluate a design solution based on the criteria and constraints** and the potential impacts on people and the natural environment that may limit possible solutions; **use a systematic process to support a claim about the relative effectiveness** of competing design solutions based on the strengths and weaknesses of each and how well they meet the criteria and constraints of the problem; **use quantitative analysis of data from tests** to compare several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success; and **develop and use a model to generate** multiple forms of data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.