SCIENCE PERFORMANCE LEVEL DESCRIPTORS – PHYSICAL SCIENCE

ADVANCED

A student performing at Advanced effectively, consistently, and appropriately applies science and engineering practices to explain phenomena and design solutions to problems in the natural and the designed world. The student uses information to evaluate patterns in data and revise models that support scientific claims, explain relationships among variables, and predict, based on scientific principles and reasoning, how the variables will change over time. The student revises the design of investigations in order to collect data that can describe quantitative relationships among variables. The student analyzes patterns in data to determine which solution best meets the criteria and constraints of a problem. The student uses data, mathematical and computational thinking, and scientific principles to construct explanations of scientific processes and arguments about stability and change within systems.

PROFICIENT

A student performing at Proficient effectively applies science and engineering practices to explain phenomena and design solutions to problems in the natural and the designed world. The student develops models and uses information and patterns in data to support scientific arguments, describe relationships among variables, and predict how the variables will change over time. The student plans investigations to determine proportional relationships among variables. The student analyzes patterns in data to evaluate how well a solution meets the criteria and constraints of a problem. The student uses data, mathematical and computational thinking, and scientific principles to construct explanations of scientific processes and arguments about how systems and system parts will change over time.

BASIC

A student performing at Basic applies, with support, science and engineering practices to explain phenomena and design solutions to problems in the natural and the designed world. The student uses models, information, and patterns in data to support scientific arguments, identify the relationship between two variables, and make predictions about how changes to one variable will affect other variables. The student describes the data to collect in an investigation in order to identify proportional relationships among variables. The student uses patterns in data to identify a solution that meets given criteria and constraints of a problem. The student uses data, basic algebraic thinking, and scientific principles to support explanations of scientific processes and arguments about how systems and system parts will change over time.

BELOW BASIC

A student performing at Below Basic seldom applies science and engineering practices to explain phenomena and design solutions to problems in the natural and the designed world. The student occasionally identifies models, information, and patterns in data to describe relationships between two variables and make predictions about how changes to one variable will affect other variables. The student infrequently recognizes trends in the data collected during an investigation in order to identify the relationships among variables. The student can sometimes use patterns in data to identify a solution to a problem. The student occasionally uses data and basic algebraic thinking to explain how systems and system parts change over time.

SCIENCE PERFORMANCE LEVEL DESCRIPTORS – PHYSICAL SCIENCE

Physical Science	**Below Basic** A student who has reached the level of *Below Basic* level is to successfully address some, but not all, of the following:	**Basic** A student who has reached the level of *Basic* is able to successfully address some, but not all, of the following:	**Proficient** A student who has reached the level of *Proficient* is able to successfully address some, but not all, of the following:	**Advanced** A student who has reached the level of *Advanced* is able to successfully address some, but not all, of the following:
Matter and Its Interactions	Identify chemical and atomic properties.	Identify the pattern of chemical and atomic properties using the periodic table	Predict chemical and atomic properties using the periodic table.	Explain chemical and atomic properties by examining the relative placement of elements on the periodic table.
	Identify an explanation for products of a simple chemical reaction.	Revise an explanation for products of a simple chemical reaction.	Construct an explanation for products of a simple chemical reaction.	Evaluate an explanation for products of a simple chemical reaction.
	Recognize different bulk properties of matter and its physical changes.	Measure or record different bulk properties of matter and its physical changes.	Gather evidence through investigation to compare different bulk properties of matter and its physical changes.	Investigate and explain the results of a chemical reaction using chemical properties.
	Recognize molecular properties of designed materials.	Describe molecular properties of designed materials.	Communicate the function of a designed material based on its molecular properties.	Evaluate the function of a designed material based upon its molecular properties through investigation.
	Identify the chemical properties that can change during a chemical reaction.	Describe the chemical properties that can change during a chemical reaction.	Use chemical properties to explain the outcome of a chemical reaction.	Analyze or evaluate chemical properties to explain the outcome of a chemical reaction.
	Identify changes in chemical reaction rates.	Describe changes in chemical reaction rates.	Use evidence to explain changes to chemical reaction rates.	Collect and evaluate evidence to explain changes to chemical reaction rates.
	Identify a refined design of a chemical system.	Describe a refined design of a chemical system.	Refine a design of a chemical system by specifying a change in conditions that would alter the amount of products at equilibrium.	Analyze or evaluate a design of a chemical system by specifying a change in conditions that would alter the amount of products at equilibrium.
	Recognize that mass is conserved during chemical reactions.	Describe that mass is conserved during chemical reactions.	Use mathematical representations to support an argument for the conservation of mass in a chemical reaction.	Use evidence and mathematical representations to support an argument for the conservation of mass in a chemical reaction.
	Recognize changes in the composition of the nucleus of the atom or the release of energy during fission, fusion, or radioactive decay.	Describe changes in the composition of the nucleus of the atom or the release of energy during fission, fusion, or radioactive decay.	Use models to illustrate changes in the composition of the nucleus of the atom and the release of energy during fission, fusion, or radioactive decay.	Evaluate models to explain changes in the composition of the nucleus of the atom and the release of energy during fission, fusion, or radioactive decay.

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Physical Science	**Below Basic** A student who has reached the level of *Below Basic* level is to successfully address some, but not all, of the following:	**Basic** A student who has reached the level of *Basic* is able to successfully address some, but not all, of the following:	**Proficient** A student who has reached the level of *Proficient* is able to successfully address some, but not all, of the following:	**Advanced** A student who has reached the level of *Advanced* is able to successfully address some, but not all, of the following:
Motion Stability: Forces and Interactions	Recognize Newton's second law to describe force and motion relationships.	Use Newton's second law to describe force and motion relationships.	Use evidence to compare the effects of forces on an object's motion.	Analyze evidence that supports Newton's second law of motion.
	Recognize the concept of the conservation of momentum.	Explain the concept of the conservation of momentum.	Use a mathematical representation to support the claim there is conservation of momentum in a system.	Use mathematical representations to explain the conservation of momentum.
	Identify forces that act at a distance.	Describe and predict forces that act at a distance.	Use mathematical representations to describe and predict forces that act at a distance.	Use models and mathematical representations to describe and predict forces that act a distance.
	Identify Newton's Law of Gravitation or recognize gravitational forces between objects.	Describe Newton's Law of Gravitation or predict gravitational forces between objects.	Use mathematical models to explain Newton's Law of Gravitation and predict gravitational forces between objects.	Analyze and evaluate mathematical models to explain Newton's Law of Gravitation and predict gravitational forces between objects.
	Identify evidence of an electric current producing a magnetic field or changing the magnetic field can produce electric current.	Describe evidence of an electric current producing a magnetic field or changing the magnetic field can produce electric current.	Investigate an electric current producing a magnetic field or changing the magnetic field can produce electric current.	Identify a the best design to provide evidence from an investigation to explain an electric current producing a magnetic field or changing the magnetic field can produce electric current.
Energy	Recognize a change in energy of one component of the system.	Describe a change in energy of one component of the system.	Use mathematical models to calculate a change in energy of one component of the system.	Analyze or evaluate mathematical models to calculate a change in energy of one component of the system.

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Physical Science	**Below Basic** A student who has reached the level of *Below Basic* level is to successfully address some, but not all, of the following:	**Basic** A student who has reached the level of *Basic* is able to successfully address some, but not all, of the following:	**Proficient** A student who has reached the level of *Proficient* is able to successfully address some, but not all, of the following:	**Advanced** A student who has reached the level of *Advanced* is able to successfully address some, but not all, of the following:
	Identify that energy can be a combination of motion and relative position of particles.	Describe that energy can be a combination of motion and relative position of particles.	Use models to explain that energy can be a combination of motion and relative position of particles.	Analyze or evaluate a model to explain that energy can be a combination of motion and relative position of particles.
	Identify a design that involves the conversion of energy.	Describe a design that involves the conversion of energy.	Refine a design that involves the conversion of energy.	Make multiple refinements to a design that involves multiple conversions of energy.
	Recognize how thermal energy is distributed in a closed system.	Describe how thermal energy is distributed in a closed system.	Investigate how thermal energy is distributed in a closed system.	Investigate and explain how thermal energy is distributed in a closed system.
	Recognize two objects interacting through electric or magnetic fields.	Predict the interaction between two objects through electric or magnetic fields.	Use a model to describe the interaction between two objects through electric or magnetic fields and the changes in energy due to the interaction.	Analyze, evaluate, or refine a model to explain the interaction between two objects through electric or magnetic fields and the changes in energy due to the interaction.
Waves and Their Applications in Technologies for Information Transfer	Identify how waves behave in different media.	Describe how waves behave in different media.	Use mathematical representations to explain how waves behave in different media.	Use mathematical representations and models to explain how waves behave in different media.
	Recognize wave and particle models of electromagnetic radiation.	Describe wave and particle models of electromagnetic radiation.	Evaluate the use of wave and particle models to describe light.	Evaluate the use of wave and particle models to describe and predict the behavior of light.
	Identify information about electromagnetic radiation interacting with matter.	Describe information about electromagnetic radiation interacting with matter.	Explain information about electromagnetic radiation interacting with matter.	Analyze and evaluate information about electromagnetic radiation interacting with matter.

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Physical Science	**Below Basic** A student who has reached the level of *Below Basic* level is to successfully address some, but not all, of the following:	**Basic** A student who has reached the level of *Basic* is able to successfully address some, but not all, of the following:	**Proficient** A student who has reached the level of *Proficient* is able to successfully address some, but not all, of the following:	**Advanced** A student who has reached the level of *Advanced* is able to successfully address some, but not all, of the following:
	Identify or describe claims regarding the effects different frequencies of electromagnetic radiation have when absorbed by matter.	Explain claims regarding the effects different frequencies of electromagnetic radiation have when absorbed by matter.	Analyze claims regarding the effects different frequencies of electromagnetic radiation have when absorbed by matter.	Analyze and evaluate claims regarding the effects different frequencies of electromagnetic radiation have when absorbed by matter.

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Earth and Space Science	**Below Basic** A student who has reached the level of *Below Basic* level is to successfully address some, but not all, of the following:	**Basic** A student who has reached the level of *Basic* is able to successfully address some, but not all, of the following:	**Proficient** A student who has reached the level of *Proficient* is able to successfully address some, but not all, of the following:	**Advanced** A student who has reached the level of *Advanced* is able to successfully address some, but not all, of the following:
Earth's Place in the Universe	Identify the relationship between star properties and released energy.	Describe the relationship between star properties and released energy.	Develop a model to explain the relationship between star properties and released energy.	Use evidence and models to explain the relationship between star properties and released energy.
	Identify the big bang theory.	Summarize the big bang theory.	Use astronomical evidence to support the big bang theory.	Synthesize astronomical evidence to support the big bang theory.
	Identify the present orbital motions of objects in the solar system.	Describe the present orbital motions of objects in the solar system.	Use mathematical representations to predict orbital motions of objects in the solar system.	Use mathematical representations and models to explain predictions of orbital motions of objects in the solar system.
Earth's Systems	Identify tectonic-plate movements that describe the relative ages of different materials on Earth.	Use tectonic-plate movements to describe the relative ages of different materials on Earth.	Use tectonic-plate movements to evaluate evidence for the ages of different materials on Earth.	Use tectonic-plate movements and models to evaluate evidence for the ages of different materials on Earth.
	Identify data used to describe Earth's formation or early history.	Identify and describe data used to summarize Earth's formation or early history.	Use physical evidence to explain Earth's formation or early history.	Use physical evidence to support an argument about Earth's formation or early history.
	Identify physical processes on Earth's surface and within earth that shape Earth's features over time and space.	Describe how physical processes on Earth's surface and within earth shape Earth's features over time and space.	Use models to explain how physical processes on Earth's surface and within earth shape Earth's features over time and space.	Use models and data to explain how physical processes on Earth's surface and within earth shape Earth's features over time and space.

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Engineering and Technology Science	**Below Basic** A student who has reached the level of *Below Basic* level is to successfully address some, but not all, of the following:	**Basic** A student who has reached the level of *Basic* is able to successfully address some, but not all, of the following:	**Proficient** A student who has reached the level of *Proficient* is able to successfully address some, but not all, of the following:	**Advanced** A student who has reached the level of *Advanced* is able to successfully address some, but not all, of the following:
Engineering Design	Recognize criteria or constraints for solutions to a major global challenge.	Specify/describe criteria and constraints for solutions to a major global challenge that account for societal needs and wants.	Analyze criteria and constraints for solutions to a major global challenge that account for societal needs and wants.	Evaluate criteria and constraints for solutions to a major global challenge that account for societal needs and wants.
	Recognize an engineering problem.	Identify that engineering problems can be broken down into smaller problems.	Design solutions to smaller problems in the context of a larger problem.	Evaluate solutions to smaller problems in the context of a larger problem.
	Identify the needs or trade-offs of an engineering design.	Identify the needs and trade-offs of an engineering design.	Use prioritized needs and trade-offs of an engineering design to evaluate a complex, real-world problem.	Use prioritized needs and trade-offs of an engineering design to optimize a solution to a complex, real-world problem.
	Identify a solution to a design problem.	Identify the most appropriate solution to a design problem.	Use models to explain the most appropriate solution to a design problem.	Evaluate models to argue for the most appropriate solution to a design problem.