ARIZONA SCIENCE TEST

Science Grade Band 6–8
Performance Level Descriptors (PLDs)

	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student strives to	The Partially Proficient student is able to	The Proficient student is able to	The Highly Proficient student is able to
Physical Science Core Ideas/Claims				
P1 All matter in the Universe is made of very small particles.	● identify the different particle motion in states of matter ● identify changes in temperature and/or pressure in matter ● identify atoms as basic units of matter ● determine if a chemical reaction has occurred based on the rearrangement of particles ● identify unique physical and chemical properties of substances	● differentiate particle motion in different states of matter ● differentiate states of matter due to changes in temperature and/or pressure ● associate different properties to atomic makeup ● show rearrangement of particles in chemical reactions ● differentiate chemical from physical properties of substances	● demonstrate changes in state of matter are due to different rates of particle motion ● demonstrate that variations in temperature and/or pressure affect states of matter ● demonstrate matter is made up of particles called atoms ● demonstrate that matter is conserved in chemical reactions ● identify substances based on unique chemical and physical properties	● evaluate result of change in particle motion to state of matter ● predict changes in states of matter due to changes in temperature and/or pressure ● critique models demonstrating that matter is made of atoms ● predict the outcome of the rearrangement of particles in chemical reactions with regard to conservation of matter ● predict types of properties used to distinguish different substances
P2 Objects can affect other objects at a distance.	● identify forces that act at a distance ● identify effects of electromagnetic forces	● differentiate how forces at a distance affect objects ● differentiate repulsive from attractive magnetic forces	● predict how forces acting at a distance affect objects ● demonstrate magnetic forces can repel or attract and can vary in strength	● evaluate predictions of effects of force acting on objects at a distance ● evaluate nature of magnetic force and how strength varies at a distance
P3 Changing the movement of an object requires a net force to be acting on it.	● identify the components of gravitational force ● identify concepts of Newton's laws of motion	● identify that there is a relationship between mass, gravity, and distance. ● demonstrate concepts of Newton's laws of motion	● demonstrate how objects on Earth are affected by gravitational force ● apply concepts of Newton's laws of motion	● predict how objects on Earth are affected by gravity ● evaluate how changes in mass and distance affect gravitational forces on objects

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				● evaluate concepts of Newton's laws of motion
P4 The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.	● categorize methods of energy storage or use of potential and kinetic energy ● identify energy transfers ● identify when waves occur ● identify efficiency in energy transfers ● identify when and how energy leaves a system	● differentiate storage of potential energy and uses of kinetic energy ● distinguish types of energy transfers ● identify wave characteristics and interactions ● differentiate between the levels of efficiency in energy transfer	● demonstrate how humans use technology to store potential energy and use kinetic energy ● demonstrate how energy is transferred ● describe wave characteristics and interactions ● describe a solution that leads to increases in efficiency of energy transfer	● evaluate methods of energy storage and uses of kinetic energy ● recommend solutions regarding technology solutions for energy storage or use of kinetic energy ● evaluate or revise explanations of energy transfer methods ● use, revise, or evaluate explanations of wave characteristics or interactions ● predict the impact of wave characteristics when the amount of energy in the system is changed ● evaluate solutions leading to increases in efficiency of energy transfer

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Earth and Space Science Core Ideas/Claims				
E1 The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.	● identify radiation from the sun as the cause of the warming of Earth's surface and atmosphere ● identify the components of Earth's atmosphere, hydrosphere, and geosphere that cycle matter ● identify structures to provide evidence of plate motions ● identify methods to determine relative age of rock layers ● identify how data is collected for natural hazards and geologic events ● identify types of human consumption that impact the biosphere ● identify different types of technology used in weather prediction	● distinguish how radiation from the sun is absorbed by different layers of Earth's surface and atmosphere ● differentiate components of Earth's atmosphere, hydrosphere, and geosphere where energy flows and matter is cycled ● select evidence that can be used to show past plate motions ● examine how rock layers and fossils can be useful in determining relative age ● recognize that there are patterns in data that can be used to predict future natural hazards and geologic events ● differentiate between the consumption of limited and unlimited resources ● examine types of technology used in weather prediction	● show that external radiation from the sun is captured in Earth's surface and atmosphere, providing warmth ● demonstrate how matter cycles and energy flows within Earth's atmosphere, hydrosphere, and geosphere ● demonstrate how past plate motions can be determined with available evidence ● demonstrate how data from Earth's geological column can be used to communicate the relative ages of rock layers and fossils ● synthesize information about data and historical patterns to predict natural hazards and other geological events ● demonstrate how human consumption of limited resources affects the biosphere ● demonstrate how advances in technology have improved weather prediction	● evaluate how Earth's layers and atmosphere capturing thermal energy ● evaluate how energy flows and matter is cycled in Earth's atmosphere, hydrosphere, and geosphere ● evaluate evidence used to determine past motion of plates ● evaluate methods of determining relative age ● predict the likelihood of natural hazards and other geological events based on data and historical patterns ● predict effects on the biosphere due to human consumption of limited resources ● design a solution to improve technology in weather prediction
E2 The Earth and our solar system are a very small part of one of many galaxies within the Universe.	● differentiate between rotation and revolution ● identify the spatial relationship within the Sun-Earth-Moon system ● correlate the tilt of Earth's axis with the amount of sunlight it receives	● make observations about the scale, properties, or relationships of objects in the solar system ● distinguish different positions of night sky patterns due to Earth's position ● identify moon phases, eclipses, and tides	● classify objects in the solar system based on scale, properties, or relationships ● demonstrate why night sky patterns have apparent motion ● demonstrate how moon phases, eclipses, and tides occur ● demonstrate that Earth's tilted axis causes changes in	● evaluate classification of objects in the solar system based on scale, properties, or relationships to demonstrate phenomena in the solar system ● predict location of night sky patterns due to Earth's revolution ● determine the probability of the occurrence of specific

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		● distinguish seasons on Earth due to the tilt of Earth's axis	seasons and the amount of daylight	tides or eclipses during a specific phase of the moon. ● predict possible impacts of a change in Earth's tilted axis, rotation, or revolution

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Life Science Core Ideas/Claims				
L1 Organisms are organized on a cellular basis and have a finite life span.	● identify cells as the basis of all living things ● identify plant and animal cells ● identify cells, tissues, and organs ● identify external factors affecting an organism's internal stability	● distinguish components of cell theory ● differentiate between components of plant and animal cells and their functions ● differentiate between cells, tissues, and organs and their functions ● differentiate an organism that is in a state of internal stability from an organism that is not	● synthesize evidence to support the explanation of cell theory ● demonstrate the relationship between structure and function in cells of plants and animals ● demonstrate how cells, tissues, and organ systems are organized and interact to maintain life ● demonstrate how equilibrium is maintained and evaluate the effect of external factors on internal stability	● evaluate evidence of cell theory ● predict how a change in structure affects function of plant or animal cells to reestablish internal stability (based on changes in external factors)
L2 Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.	● identify human activities that impact the environment ● identify biotic and abiotic factors in the environment ● identify the matter and energy that cycles in an ecosystem ● identify which plant cells can convert light energy to food energy	● distinguish human activities that impact the environment and affect competition for energy and resources ● identify factors that cause change in species ● demonstrate how organisms depend on the environment, including biotic and abiotic factors ● use a model to distinguish how matter is cycled and energy flows in an ecosystem ● identify the products and reactants in the process of converting light energy to food energy (photosynthesis) in some plant cells	● demonstrate how human activities impact the environment and affect competition for energy and resources ● demonstrate how human activities impact the factors that cause species to change ● demonstrate the interdependence of organisms and their environment, including biotic and abiotic factors ● demonstrate the cycling of matter and the flow of energy in an ecosystem ● demonstrate how some plant cells convert light energy into food energy (photosynthesis)	● evaluate explanations of how human activities impact the environment and affect competition for energy and resources ● predict how a change in human activities would impact the factors that cause a change in species ● predict how a change in a biotic and abiotic factor would affect organisms and their environment ● evaluate effects of changes in cycling of matter and flow of energy in ecosystems ● demonstrate how the process to convert light energy into food energy (photosynthesis) can be impacted by a change in biotic or abiotic factors

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L3 Genetic information is passed down from one generation of organisms to another.	● identify traits that can vary from parent to offspring ● identify scientific studies that used technology to conduct genetic research	● distinguish genetic variations that occur through inheritance versus from mutation ● describe the technology used in scientific studies to conduct genetic research	● demonstrate how genetic variations occur in offspring through inheritance or through mutation ● demonstrate how technology has furthered the field of genetic research and cite effects of studies on human lives	● predict genetic variations that may result from inheritance or mutation ● propose a solution to reduce the impact of a technology used in genetic research
L4 The unity and diversity of organisms, living and extinct, is the result of evolution.	● identify the frequency of traits that exist in a population ● identify external pressures that can affect the process of natural selection	● distinguish traits that increase or decrease in a population over time due to natural selection ● describe how external pressures affect the process of natural selection	● demonstrate how natural selection can alter the frequency of traits in a population over time ● show how natural selection provides an explanation of how new species can evolve	● evaluate explanations of how natural selection affects trait frequency over time ● evaluate explanations of how natural selection promotes the emergence of new species

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Science and Engineering Practices				
Ask questions and define problems	● ask questions that identify evidence ● ask questions that can be investigated scientifically	● ask questions that identify evidence or the premise(s) of an argument ● ask questions to determine independent and dependent variables ● ask questions that frame a hypothesis ● ask questions that arise from observation of phenomena	● ask questions that clarify evidence and/or the premise(s) of an argument ● ask questions to determine relationships between variables ● ask questions that frame a hypothesis based on observations and scientific principles ● ask questions that arise from careful observation of phenomena, to clarify and/or seek additional information	● ask questions that require sufficient and appropriate empirical evidence to answer ● ask questions to clarify and/or refine a model, an explanation, or an engineering problem ● ask questions that challenge the premise(s) of an argument or the interpretation of data ● ask questions that arise from careful observation of unexpected results to clarify and/or seek additional information
Develop and use models	● identify models that describe phenomena ● identify modifications in models	● develop and use models to describe, test, and predict phenomena and design systems ● develop and use models to represent evidence ● develop and use models to show the relationships among variables	● develop and use models to describe, test, and predict more abstract phenomena and design systems ● develop or modify a model—based on evidence—to match what happens if a variable or component of a system is changed ● develop and use models to show relationships among variables, including those that are not observable ● develop and use models to predict and/or describe phenomena ● develop and use models to generate data to test ideas about phenomena in natural or designed systems	● develop, revise, and use models to evaluate or revise a model for a proposed object or tool ● develop, revise, and use models to evaluate a model of simple systems with uncertain and less predictable factors ● develop, revise, and use models to propose design changes to show the relationships among variables, including those that are not observable ● develop, revise, and use models to describe unobservable mechanisms ● develop, revise, and use models to generate data to test ideas about phenomena in natural or designed systems, including

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				those representing inputs and outputs, and those at unobservable scales
Plan and carry out investigations	● identify variables ● collect data	● carry out pre-planned investigations that use multiple variables and provide evidence to support explanations ● carry out pre-planned investigations that involve independent and dependent variables and controls ● carry out pre-planned investigations that include various methods for collecting data	● develop a plan and carry out investigations that evaluate the accuracy of various methods for collecting data ● develop a plan and carry out investigations that produce data to answer scientific questions or test design solutions ● develop a plan and carry out investigations that collect data about the performance of a proposed object, tool, process, or system	● plan, carry out, evaluate, and revise investigations that include how measurements will be recorded and how much data is needed to support a claim ● plan, carry out, evaluate, and revise investigations that involve an evaluation and/or revisions to the experimental design
Analyze and interpret data	● identify relationships contained in graphical displays of data	● identify, distinguish, or describe data to construct graphical displays of data ● identify, distinguish, or describe data to match graphical displays with data sets	● analyze and interpret data to identify linear and nonlinear relationships in graphical displays ● analyze and interpret data using graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships ● analyze and interpret data to distinguish between causal and correlational relationships in data ● analyze and interpret data to provide evidence for phenomena ● analyze and interpret data to seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials) ● analyze and interpret data to determine similarities and	● analyze, interpret, and evaluate data to extend quantitative analysis to investigations, distinguishing between correlation and causation ● analyze, interpret, and evaluate data to apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible ● analyze, interpret, and evaluate data to define an optimal operational range for a proposed object, tool, process, or system that best meets criteria for success

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			differences in findings	
Use mathematics and computational thinking	● identify patterns in data sets	●use mathematical and computational thinking to distinguish patterns in data sets that support explanations and arguments	●use mathematical and computational thinking in the selection of digital tools (e.g., computers) to analyze very large data sets for patterns and trends ●use mathematical and computational thinking to describe and/or support scientific conclusions and design solutions ●use mathematical and computational thinking in the use of digital tools and/or mathematical concepts and arguments	●use mathematical and computational thinking to create or evaluate algorithms (a series of ordered steps) to solve a problem ●use mathematical and computational thinking to apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems ●use mathematical and computational thinking to test and compare proposed solutions to an engineering design problem
Construct explanations and design solutions	●identify evidence that support scientific ideas, principles, and theories ●identify models or representations that support an explanation	●distinguish between explanations and solutions to identify those supported by multiple sources of evidence consistent with scientific ideas ●distinguish between explanations and solutions to identify those that include qualitative or quantitative relationships between variables that describes phenomena ●distinguish between explanations and solutions to identify those based on valid and reliable evidence	●construct explanations and design solutions that include qualitative or quantitative relationships between variables that predict phenomena ●construct explanations and design solutions that apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion	●construct and evaluate explanations and solutions that apply scientific ideas or principles in testing a design of an object, tool, process, or system ●construct and evaluate explanations and solutions that meet specific design criteria and constraints ●construct and evaluate explanations and solutions that optimize performance of a design by prioritizing criteria
Engage in argument from evidence	●identify arguments on the same topic	●differentiate between two arguments on the same topic	●construct a convincing argument that supports claims ●engage in arguments from evidence to compare and	●engage in arguments from evidence to construct, evaluate, or revise a convincing argument that refutes claims

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			critique two arguments and analyze whether they emphasize similar or different evidence	●engage in arguments from evidence to provide critiques about explanations, procedures, models, and questions by citing relevant evidence
Obtain, evaluate, and communicate information	●identify the accuracy of ideas and methods	●distinguish between the reliability of ideas and methods based on the credibility of sources	●obtain, evaluate, and communicate information to critically review scientific information to determine the central idea ●obtain, evaluate, and communicate information to describe patterns in and/or evidence about the natural and designed world(s) ●obtain, evaluate, and communicate information to evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts ●obtain, evaluate, and communicate information to communicate scientific and/or technical information	●obtain, evaluate, and communicate information to synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias and methods used, and describe how they are supported or not supported by evidence

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Cross-cutting Concepts				
Patterns	●identify patterns in rates of change	●distinguish patterns in numerical relationships that provide information about natural- and human-designed systems	●recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure ●identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems ●use graphs, charts, and images to identify patterns in data	●use patterns to identify cause-and-effect relationships, and use graphs and charts to identify patterns in data ●evaluate patterns to identify cause-and-effect relationships
Cause and effect	●identify relationships as causal	●describe relationships as correlational ●understand that phenomena may have more than one cause	●classify relationships as causal or correlational, and recognize that correlation does not necessarily imply causation ●use cause-and-effect relationships to predict phenomena ●understand that some cause-and-effect relationships can only be described using probability	●evaluate causal or correlational relationships, and recognize that correlation does not necessarily imply causation ●identify some cause-and-effect relationships that can only be described using probability
Structure and function	●identify how the shape of a structure determines its function ●identify how designed structures determine how they function	●understand how the function of a structure depends on the shape, composition, and relationships among its parts ●differentiate complex designed structures and systems to determine how they function	●describe complex and microscopic structures and systems to demonstrate how their function depends on the shapes, composition, and relationships among its parts ●analyze complex natural and designed structures and systems to determine how they function	●evaluate complex and microscopic structures and systems and visualize how their function depends on the shapes, composition, and relationships among its parts ●design structures to serve particular functions by taking into account properties of different materials and how materials can be shaped and used
Systems and systems models	●identify systems that have sub-systems ●identify models that represent systems	●describe how systems may have sub-systems and are a part of larger complex systems	●understand that systems may interact with other systems; they may have sub-	●use models to represent system interactions—such as inputs, processes, and outputs—and energy, matter,

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	●identify models that are limited	●distinguish models that represent system interactions ●understand that models are limited in that they only represent certain aspects of the system	systems and be a part of larger complex systems ●use models to represent system interactions—such as inputs, processes, and outputs—and energy, matter, and information flows within systems ●identify the limitations of a specific model	and information flows within systems ●revise models to represent system interactions—such as inputs, processes and outputs
Stability and change	●identify stability and change in natural or designed systems ●identify changes in one part of a system that cause changes in another part	●describe stability and change in natural or designed systems by examining changes over time ●describe how changes in one part of a system might cause large changes in another part	●demonstrate stability and change in any system by examining changes over time and considering forces at different scales, including the atomic scale ●show that changes in one part of a system might cause large changes in another part ●show that systems in dynamic equilibrium are stable due to a balance of feedback mechanisms ●demonstrate how stability might be disturbed either by sudden events or gradual changes that accumulate over time	●predict states of stability by examining changes over time and considering forces at different scales, including the atomic scale ●predict how changes in one part of a system might cause large changes in another part
Scale, proportion, and quantity	●identify time, space, and energy at different scales	●distinguish time, space, and energy phenomena at various scales ●differentiate phenomena observed at one scale that may not be observable at another scale	●observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small ●understand that the function of natural and designed systems may change with scale ●represent scientific relationships through the use of algebraic expressions and equations	●use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to predict how a change affects the magnitude of properties and processes ●review and revise scientific relationships through the use of algebraic expressions and equations

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			●use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes ●represent scientific relationships through the use of algebraic expressions and equations	
Energy and matter	●identify situations where matter is conserved ●identify situations where energy is conserved	●describe that matter is conserved because atoms are conserved ●describe the flow of energy as it is transferred	●understand that matter is conserved because atoms are conserved in physical and chemical processes ●show that within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter ●demonstrate that energy may take different forms (e.g., energy in fields, thermal energy, energy of motion) ●demonstrate that the transfer of energy can be tracked as energy flows through a designed or natural system	●critique or revise statements that demonstrate that the transfer of energy can be tracked as energy flows through a designed or natural system