ARIZONA SCIENCE TEST

Science HS SEP & CCC PLDs
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
Science and Engineering Practices				
Asking questions and defining problems (Q/P)	● ask questions that identify observations ● ask questions that can be investigated in lab settings ● ask questions that identify design problems	● ask questions that determine relationships between variables ● ask questions that are testable ● ask questions that arise from observation of phenomena or unexpected results ● ask questions to distinguish variables	● ask questions that clarify or provide additional information about phenomena, models, or theories ● ask questions to determine relationships, including quantitative relationships, between variables ● determine if a question is testable and relevant	● ask questions that evaluate the relevance and feasibility of a proposed investigation ● ask questions that revise or clarify a model, an explanation, or an engineering design ● ask questions that challenge the premise(s) of an argument, the interpretation of data, or the suitability of a design
Developing and using models (MOD)	● identify reliable models ● identify models that illustrate a relationship between systems	● distinguish models that address the same process or system ● develop or modify a model based on evidence	● design a test of the model to ascertain reliability and identify limitations ● develop and use models to describe merits or limitations of two models of the same process ● develop and use models to show relationships between systems or components of a system ● develop and use models to generate data that support explanations of phenomena or provide a solution to a problem ● develop and use models to describe unobservable mechanisms	● evaluate or revise a model for a proposed process, tool, or system ● develop, revise, and use models to manipulate or test a proposed system ● revise and use models to describe unobservable mechanisms ● develop, revise, and use models to generate data useful in predicting phenomena

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Planning and carrying out investigations (INV)	● identify data that can be used as evidence ● identify hypotheses that properly state the independent and dependent variables	● identify and carry out investigations that generate data that can be used as evidence to support explanations ● identify and carry out investigations that produce data of sufficient quantity and accuracy to form or support explanations ● identify and carry out investigations that include safe and ethical procedures ● identify appropriate tools to collect, record, analyze, and evaluate data	● test a design by producing relevant data ● have directional hypotheses that will determine what happens to the responding variable when another variable is manipulated ● provide data of a proposed process to identify failure points or to improve performance ● use appropriate tools to collect, record, analyze, and evaluate data	● ensure proper variables are used, measured, and controlled ● improve performance relative to criteria for success or other variables
Analyzing and interpreting data (DATA)	● identify tools, technology, and/or models used in analyzing data	● identify, distinguish, or describe data to compare data sets to determine consistency of observations ● identify, distinguish, or describe data to provide an analysis of a proposed process or system	● analyze and interpret data to make a valid and reliable scientific claim ● analyze and interpret data to determine an optimal design solution ● analyze and interpret data to establish limitations of data analysis ● analyze and interpret data to identify design features or characteristics to optimize a process or system, given success criteria	● analyze, interpret, and evaluate data to generate statistical analysis including correlation coefficient for linear data, slope, and intercept using digital tools ● analyze, interpret, and evaluate data to determine measurement error ● analyze, interpret, and evaluate data to propose explanations of the impact of new data on a process or system

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Using mathematics and computational thinking (MCT)	●identify what type of data (qualitative or quantitative) is best to determine whether a proposed object or tool meets criteria for success ●identify units that accompany measurement computations	●use mathematical and computational thinking to verify a solution ●use mathematical and computational thinking to distinguish between solutions ●use mathematical and computational thinking to apply correct units to solutions	●use mathematical and computational thinking to construct a model or simulation of a process, phenomenon, or system ●use mathematical and computational thinking to select and apply correct techniques to derive a solution ●use mathematical and computational thinking to apply ratios, rates, percentages, and unit conversions in measurements	●use mathematical and computational thinking to evaluate a proposed solution ●use mathematical and computational thinking to revise a solution to include supplemental data ●use mathematical and computational thinking to convert units of complex measurements involving derived units
Constructing explanations and designing solutions (E/S)	● identify explanations supported by evidence ● identify manipulated and responding variables	● distinguish explanations and solutions that are supported by valid and reliable evidence ● distinguish explanations and solutions that contain qualitative or quantitative information regarding the relationship between variables	● make a quantitative and/or a qualitative claim regarding the relationship between manipulated and responding variables ● construct explanations and design solutions based on reliable and valid evidence obtained from a variety of sources ● apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems taking into account possible unanticipated effects ● apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion	●construct and evaluate explanations and solutions that predict outcomes when certain conditions exist ●construct and evaluate explanations and solutions that describe methods ensuring validity and reliability of results ●construct and evaluate explanations and solutions that prioritize criteria and include tradeoff considerations

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Engaging in argument from evidence (ARG)	●identify claims or evidence that support an argument	● engage in arguments from evidence to describe merits of an argument ● engage in arguments from evidence to distinguish data that support a claim or argument	●evaluate an argument or solution in light of new evidence or trade-offs ● evaluate evidence, claims, or reasons behind currently accepted explanations to determine the merits of an argument ● engage in arguments from evidence to defend a claim or argument based on evidence based on scientific knowledge ● engage in arguments from evidence to construct a claim, an argument, or counterargument based on data and evidence ● engage in arguments from evidence to compare competing design solutions based on scientific principles	● engage in arguments from evidence to evaluate competing arguments or solutions in light of new evidence or trade-offs ● engage in arguments from evidence to evaluate evidence, claims, or reasons behind currently accepted explanations to determine the merits of an argument
Obtaining, evaluating, and communicating information (INFO)	● identify useful scientific information ● identify ways to communicate scientific information	● obtain, evaluate, and communicate information to determine the central idea or conclusion of presented information ● obtain, evaluate, and communicate information to distinguish sources of information that can be used to address a scientific question or problem	● obtain, evaluate, and communicate information to summarize complex evidence, concepts, or processes ● obtain, evaluate, and communicate information to integrate credible sources that address scientific questions or solve problems ● obtain, evaluate, and communicate information to present technical information or ideas that address a phenomenon or that address the process of the development and design of a proposed solution	● obtain, evaluate, and communicate information to defend or critique the validity or reliability of claims ● obtain, evaluate, and communicate information to defend or critique the validity or reliability of sources of information

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Cross-cutting Concepts				
Patterns (PAT)	●recognize different scales among patterns ●identify mathematical representations within patterns ●identify patterns that can be used as evidence of relationships	●describe mathematical representations to identify patterns ●demonstrate how patterns can be used as evidence for relationships	●cite patterns as empirical evidence for causality in support of phenomena ●recognize that classifications or explanations used at one scale may not be useful or may need revision using a different scale ●use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system	●use patterns to explain empirical evidence for causality in support of phenomena ●recommend revisions to classifications/explanations of patterns using a more useful scale ●recommend revisions to reengineer and improve a designed system
Cause and effect (C/E)	●identify claims about specific causes and effects ●identify causal or correlational relationships and identify when correlation does not equal causation	●identify empirical evidence to differentiate between cause and correlation ●describe claims about specific causes and effects	●understand that empirical evidence is required to differentiate between cause and correlation ●use empirical evidence to make claims about specific causes and effects ●suggest cause-and-effect relationships to explain complex systems and make predictions ●propose causal relationships by examining what is known about smaller scale mechanisms within the system ●recognize that changes in systems may have various causes that may not have equal effects	●evaluate cause-and-effect relationships to explain and predict behaviors in complex systems ●evaluate empirical evidence used to differentiate between cause and correlation ●demonstrate causal relationships by examining what is known about smaller scale mechanisms within the system ●describe equal and unequal effects in relationships

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Structure and function (S/F)	● identify that the properties and structures of components are different depending on their interactions and function	● describe how the properties and structures of components are different depending on their interactions and function	● describe properties and structures of different components to explain their interactions and system function and/or solve a problem ● infer the functions and properties of objects and systems from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials	● demonstrate the functions and properties of objects and systems from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials
Systems and systems models (SYS)	● identify models to simulate the flow of energy, matter, and interactions within and between systems ● identify systems boundaries, initial conditions, inputs, and outputs ● identify models that predict the behavior of a system	● describe models to simulate the flow of energy, matter, and interactions within and between systems at different scales ● describe systems boundaries, initial conditions, inputs, and outputs ● describe models that predict the behavior of a system	● analyze a system by defining its boundaries and initial conditions, inputs, and outputs ● use models to simulate the flow of energy, matter, and interactions within and between systems at different scales ● use models to predict the behavior of a system and recognize that these predictions have limited precision and reliability due to the assumptions and approximations ● design systems to do specific tasks	● develop models to simulate the flow of energy, matter, and interactions within and between systems at different scales ● develop and use models to predict the behavior of a system and identify the limited precision and reliability due to the assumptions and approximations

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Stability and change (S/C)	● identify systems that have greater or lesser stability ● identify changes in systems over very short or very long periods of time ● identify changes to a system as irreversible or reversible	● describe systems that have greater or lesser stability ● describe changes in systems over very short or very long periods of time ● describe the effects of negative and positive feedback within a system	● construct explanations of how things change and how they remain stable ● quantify and model changes in systems over very short or very long periods of time ● recognize systems can be designed for greater or lesser stability and that some changes are irreversible ● demonstrate how feedback (negative or positive) can stabilize or destabilize a system	● demonstrate how a system can be designed for greater or lesser stability ● evaluate explanations of how things change and how they remain stable
Scale, proportion, and quantity (SPQ)	● identify scales, proportions, and/or quantities in phenomena ● identify patterns that are or are not observable at specific scales	● describe patterns that are or are not observable at specific scales ● use algebraic thinking to examine scientific data and describe changes in a system ● describe scales, proportions, and/or quantities in phenomena	● demonstrate how the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs ● recognize that patterns observable at one scale may not be observable or exist at other scales, and some systems can only be studied indirectly because they are too small, too large, too fast, or too slow to observe directly ● use orders of magnitude to understand how a model at one scale relates to a model at another scale ● use algebraic thinking to examine scientific data and predict the effect a change in one variable can have on another (e.g., linear growth vs. exponential growth)	● predict how the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs ● demonstrate that patterns observable at one scale may not be observable or exist at other scales, and some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly ● evaluate orders of magnitude to understand how a model at one scale relates to a model at another scale

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Energy and matter (E/M)	● identify changes of energy in a system in terms of energy and matter flows ● identify that energy cannot be created or destroyed	● identify changes of energy in a system in terms of energy and matter flows into, out of, and within that system ● identify that the total amount of energy and matter in closed systems is conserved	● describe that the total amount of energy and matter in closed systems is conserved ● demonstrate changes in a system in which energy and/or matter flow into, out of, or within that system ● demonstrate that energy only moves between one place and another place, between objects and/or fields, or between systems; it cannot be created or destroyed ● demonstrate that energy drives the cycling of matter within and between systems	● analyze a system to show that energy only moves between one place and another place, between objects and/or fields, or between systems; it cannot be created or destroyed