Grade 11

Performance Level Descriptions

Claim/Target	Level 2	Level 3	Level 4
Claim 1: Physical Science	Students in this range typically comprehend and **describe** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **low complexity** and **inconsistently** to problems of **moderate complexity** in the physical sciences (targets A–F).	Students in this range typically comprehend and **explain** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **moderate complexity** and **inconsistently** to problems of **high complexity** in the physical sciences (targets A–F).	Students in this range typically comprehend and **analyze** scientific ideas, connecting concepts, and procedures or practices (target A–E) and apply scientific and engineering knowledge **consistently** to problems of **high complexity** in the physical sciences (targets A–F).
Target A: Structure and Properties of Matter	Students can describe chemical and atomic properties, identify the different types of subatomic particles, measure or record different bulk properties of matter and its changes, and describe molecular properties of designed materials.	Students can compare chemical and atomic properties using the periodic table, use patterns of data to compare atomic interactions among substances, and infer the use of a designed material based upon its molecular properties.	Students can explain chemical and atomic properties by examining relative placement of elements on the periodic table, use evidence to predict the type of atomic interactions among substances, and evaluate molecular properties to critique a designed material.
Target B: Chemical Reactions	Students can describe the chemical properties that can change during a chemical reaction, identify changes in chemical reaction rate, and recognize that mass is conserved during chemical reactions.	Students can relate types of chemical reactions to patterns of chemical properties or to patterns of energy flow, relate changes in chemical reaction rates to changes in reaction conditions, and explain the conservation of mass in a chemical reaction.	Students can explain the results of a chemical reaction by using chemical trends and properties or by examining energy absorption or release, use evidence to explain changes to chemical reaction rates, and use equations to account for the conservation of mass during chemical reactions.

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Target C: Forces and Interactions	Students can identify the forces acting on an object, identify the factors related to momentum, and describe forces that act at a distance.	Students can compare the effects of forces on an object's motion, explain the conservation of momentum conceptually, and explain patterns in forces that act at a distance between objects.	Students can analyze evidence that supports Newton's second law of motion; use mathematical representations explain the conservation of momentum; and use mathematical expressions to explain the effects of fields and of the resultant forces between separated objects.
Target D: Energy	Students can identify the energy of objects within systems, describes a design that involves the conversion of energy, and identifies patterns of energy change in a closed system.	Students can relate properties of objects to their energy within systems, explain the purpose of a design that involves the conversion of energy, and describe how energy distribution stabilizes in a closed system.	Students can use mathematical models to explain changes in the energy within systems based on the position of objects within fields or the motion of objects, evaluate a design that involves the conversion of energy for a specific purpose, and use evidence to explain how energy distribution stabilizes in closed system.
Target E: Waves and Electromagnetic Radiation	Students can identify characteristics of wave behavior, describe the characteristics of electromagnetic radiation, and describe an effect of radiation on matter.	Students can explain how waves behave in different media, distinguish characteristics of light as either waves or particles, and compare the different effects of electromagnetic radiation on matter.	Students can use a mathematical representation to explain wave behavior in media, use evidence to model light as a wave or as a particle and to determine which model is more accurate in different situations, and evaluate data on the effects of electromagnetic radiation on matter.

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Target F: Engineering Design in Physical Science	Students can recognize that engineering problems have criteria for success and constraints, identify that engineering problems have smaller components, match designs to their intended solutions, and identify that engineering designs have impacts.	Students can prioritize criteria and constraints for a design challenge, organize solutions to smaller design problems that impact a larger problem, summarize trade-offs and impacts of design solutions, and distinguish key variables for modeling the impact of a design.	Students can analyze a design challenge to identify criteria and constraints that consider a global and societal view; solve a complex problem by identifying, solving, and executing on a progression of smaller subtasks; evaluate or modify a design solution to a complex problem based on evidence, priorities, and trade-offs; and evaluate a solution to a design problem using simulated model data.

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Claim 2: Life Science	Students in this range typically comprehend and **describe** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **low complexity** and **inconsistently** to problems of **moderate complexity** in the life sciences (targets A–F).	Students in this range typically comprehend and **explain** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **moderate complexity** and **inconsistently** to problems of **high complexity** in the life sciences (targets A–F).	Students in this range typically comprehend and **analyze** scientific ideas, connecting concepts, and procedures or practices (target A–E) and apply scientific and engineering knowledge **consistently** to problems of **high complexity** in the life sciences (targets A–F).

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Target A: Structure and Function	Students can describe important functions of DNA, identify how body systems are organized, and describe homeostasis using life functions that need to be regulated.	Students can relate DNA sequences to specialized cell functions, connect different cells or organ interactions within a model of bodily function, and summarize how feedback mechanisms maintain life functions in homeostasis.	Students can use evidence to explain why proteins produce specialized cell that depends upon DNA sequences, use models to explain how multiple specialized structures of cells or organs provide functions as hierarchical systems, and provide evidence of how life functions rely upon feedback mechanisms in homeostasis.
Target B: Matter and Energy in Organisms and Ecosystems	Students can describe how light energy is used by plants, describe food molecules used by organisms, and identify the carbon that can be found in Earth systems.	Students can relate the changes in plant growth to light and chemical energy, relate chemical reactions to food molecules needed by organisms, and describe how carbon is cycled through Earth systems.	Students can use models to explain the transformation of light into chemical energy in plants, use models to explain how matter and energy found in food molecules are used in organisms, and model biological processes that cycle of carbon and energy within Earth systems.
Target C: Interdependent Relationships in Ecosystems	Students can recognize that populations need resources to grow over time, identify physical and biological changes in ecosystems, and describe human activities that affect the environment and biodiversity.	Students can connect changes in living and nonliving factors to population growth, explain physical and biological interactions in ecosystems, and relate human activities to changes in the environment and biodiversity.	Students can explain population growth using equations that include living and nonliving factors, evaluate evidence of physical or biological changes that affect ecosystem conditions and stability, and evaluate designs to minimize human impacts on the environment and biodiversity.

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Target D: Inheritance and Variation of Traits	Students can recognize that all cells undergo changes during cellular divisions, identify differences in DNA sequences between parents and offspring, and describe different causes of DNA mutation.	Students can explain the changes within cells during cellular divisions, predict organism traits based upon of DNA sequences, and relate DNA changes to inheritable genetic variations.	Students can use models to explain differences in the complexity of organisms caused by cellular divisions, hypothesize a genetic cause for the variations between parents and offspring, and evaluate evidence for the cause of genetic variation in individuals and in populations using DNA evidence.
Target E: Natural Selection and Evolution	Students can describe ecological and genetic factors related to evolutionary processes, describe natural selection in a population, and describe the effects of changes in environmental conditions on populations.	Students can summarize the effects of ecological and genetic factors in evolutionary processes, relate natural selection to changes in populations, and infer changes in populations from changes in environmental conditions over time.	Students can evaluate evidence for ecological and genetic factors that result in evolutionary processes, use evidence to support adaptation of populations by natural selection, and evaluate evidence that environmental changes affect species populations over time.
Target F: Engineering Design in Life Science	Students can recognize that engineering problems have criteria for success and constraints, identify that engineering problems have smaller components, match designs to their intended solutions, and identify that engineering designs have impacts.	Students can prioritize criteria and constraints for a design challenge, organize solutions to smaller design problems that impact a larger problem, summarize tradeoffs and impacts of design solutions, and distinguish key variables for modeling the impact of a design.	Students can analyze a proposed design solution based upon criteria and constraints, evaluate solutions to smaller problems in the context of a larger problem, evaluate or modify a design solution based upon evidence and trade-offs, and argue for the most appropriate solution to a design problem using model data as evidence.

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Claim 3: Earth and Space Science	Students in this range typically comprehend and **describe** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **low complexity** and **inconsistently** to problems of **moderate complexity** in the earth and space sciences (targets A–F).	Students in this range typically comprehend and **explain** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **moderate complexity** and **inconsistently** to problems of **high complexity** in the earth and space sciences (targets A–F).	Students in this range typically comprehend and **analyze** scientific ideas, connecting concepts, and procedures or practices (targets A–E) and apply scientific and engineering knowledge **consistently** to problems of **high complexity** in the earth and space sciences (targets A–F).
Target A: Space Systems	Students can identify key characteristics of different stars, summarize the Big Bang Theory, and describe the present motions of Solar System objects conceptually.	Students can connect differences in light emission from stars to their physical characteristics, connect astronomical data to the Big Bang Theory, and describe present motions of Solar System objects using mathematical representations.	Students can use models to explain the relationship between star properties and released energy, synthesize astronomical evidence to support the Big Bang Theory, and explain past and future orbital motions of Solar System objects using mathematical representations.
Target B: History of Earth	Students can recognize that Earth's materials change over time, identify data used to describe Earth's formation or early history, and describe changes from physical processes that shape Earth's features.	Students can identify patterns among rocks or minerals from different locations or of different ages, summarize how Earth's systems and physical forces leave evidence about Earth's formation or early history, and compare physical processes that shape Earth's features.	Students can support an argument for the ages of different materials on Earth using tectonic plate movements, draw conclusions about Earth's formation or early history from physical evidence, and use models to explain how physical processes on Earth's surface and within Earth shape Earth's features over time and space.

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Target C: Earth's Systems	Students can identify a feedback cycle in Earth's systems, identify features of Earth's interior, and describe water cycle processes on Earth.	Students can relate how changes in feedback processes affect Earth's systems, describe the flow of materials in Earth's interior, and connect a water cycle process to an effect on Earth.	Students can support an argument with data that Earth's systems are connected through feedback cycles, evaluate evidence of the cycling of material in Earth's interior, and use data from investigations to evaluate the effects of the water cycle on Earth's systems.
Target D: Weather and Climate	Students can list different movements of energy on Earth and graph data to find changes in Earth's climate.	Students can infer the effects of increasing or decreasing energy flow through Earth's systems and use patterns of data as evidence of changes to Earth's climate or Earth's systems.	Students can create a model connecting the energy flow through Earth's systems to the climate and climatic changes and analyze data to hypothesize future changes to Earth's climate and related impacts to Earth's systems.
Target E: Human Sustainability	Students can describe natural resources and natural hazards, recognize the impacts of human use of natural resources, and identify several human activities that affect natural systems.	Students can connect differences in natural resources or natural hazards to human activities, compare design solutions for cost-effective uses of natural resources, and summarize data about the impact of human activities on natural systems.	Students can use evidence to explain the effects of natural resources or of natural hazards on human activity, argue for optimum cost-benefit design solutions for the use of natural resources, and evaluate impacts of human activities on natural systems.

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Target F: Engineering Design in Earth and Space Science	Students can recognize that engineering problems have criteria for success and constraints, identify that engineering problems have smaller components, match designs to their intended solutions, and identify that engineering designs have impacts.	Students can prioritize criteria and constraints for a design challenge, organize solutions to smaller design problems that impact a larger problem, summarize trade-offs and impacts of design solutions, and distinguish key variables for modeling the impact of a design.	Students can analyze a proposed design solution based upon criteria and constraints, evaluate solutions to smaller problems in the context of a larger problem, evaluate or modify a design solution based upon evidence and trade-offs, and argue for the most appropriate solution to a design problem using model data as evidence.

Note: All Engineering Targets share similar PLD features but should not be compared.