Grade 11

Performance Level Descriptions – All Dimensions

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 they 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 they 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 (targets A–E), and they 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 physical changes, and describe molecular properties of designed materials.	Students can predict chemical and atomic properties using the periodic table as a model, investigate different bulk properties of matter and its physical changes, and communicate the function of a designed material based upon its molecular properties.	Students can explain chemical and atomic properties by examining the relative placement of elements on the periodic table as a model, investigate and evaluate different bulk properties of matter and its physical changes, and evaluate the function of a designed material based upon its molecular properties.
Target B: Chemical Reactions	Students can describe the chemical properties that can change during a chemical reaction, identify changes in chemical reaction rates, and recognize that mass is conserved during chemical reactions.	Students can use chemical properties to explain the outcome of a chemical reaction, use evidence to explain changes in chemical reaction rates, and use mathematical representations to support an argument for the conservation of mass in a chemical reaction.	Students can investigate and explain the results of a chemical reaction using chemical properties, collect and use evidence to explain changes to chemical reaction rates, and use evidence and mathematical representations to support an argument for the conservation of mass in a chemical reaction.

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Target C: Forces and Interactions	Students can use Newton's second law to describe force and motion relationships, explain the concept of the conservation of momentum, and describe and predict forces that act at a distance.	Students can compare the effects of forces on an object's motion, use a mathematical representation to support the claim there is conservation of momentum in a system, and use mathematical representations to describe and predict forces that act at a distance.	Students can analyze evidence that supports Newton's second law of motion, use mathematical representations to explain the conservation of momentum, and use models and mathematical representations to describe and predict forces that act at a distance.
Target D: Energy	Students can use objects' positions and motions to describe their energy, describe a design that involves the conversion of energy, and describe how thermal energy is distributed in a closed system.	Students can use the position and motion of objects to develop and use models that illustrate changes in energy, refine a design that involves the conversion of energy, and investigate how thermal energy is distributed in a closed system.	Students can use the position and motion of objects to develop and use models that explain the changes in energy, refine a design that involves multiple conversions of energy, and investigate and explain how thermal energy is distributed in a closed system.
Target E: Waves and Electromagnetic Radiation	Students can describe how waves behave in different media, describe wave and particle models of electromagnetic radiation, and identify the advantages of using digital information over analogue.	Students can use mathematical representations to explain how waves behave in different media, evaluate the use of wave and particle models to describe light, and evaluate questions about the advantages of using digital information over analogue.	Students can use mathematical representations and models to explain how waves behave in different media, investigate and evaluate the use of wave and particle models to describe light, and evaluate questions and data about the advantages of using digital information over analogue.

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Target F: Engineering Design in Physical Science	Students can identify that engineering problems can be broken down into smaller problems, identify the needs and trade-offs of an engineering design, and identify the most appropriate solution to a design problem.	Students can design solutions to smaller problems in the context of a larger problem; use prioritized needs and trade-offs of an engineering design to evaluate a complex, real-world problem to prioritize; and use models to explain the most appropriate solution to a design problem.	Students can evaluate solutions to smaller problems in the context of a larger problem; use prioritized needs and trade-offs of an engineering design to optimize a solution to a complex, real-world problem; and evaluate models to argue for the most appropriate solution to a design problem.

Claim/Target	Level 2	Level 3	Level 4
Claim 2: Life Science	Students in this range typically comprehend and **describe** scientific ideas, connecting concepts, and procedures or practices (targets A–E), and they 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 they 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 (targets A–E), and they 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 how DNA sequences relate to specialized cell functions, identify how interacting cells or organs provide specific functions, and summarize how life functions rely upon homeostasis.	Students can use evidence to explain how DNA sequences relate to specialized cell functions, use models to explain how interacting cells or organs provide specific functions, and investigate how life functions rely upon feedback mechanisms in homeostasis.	Students can collect evidence to explain how DNA sequences relate to specialized cell functions, use models and evidence to explain how interacting cells or organs provide specific functions, and investigate and evaluate evidence of how life functions rely upon feedback mechanisms in homeostasis.
Target B: Matter and Energy in Organisms and Ecosystems	Students can to describe the transformation in plants of light into chemical energy, describe how matter and energy found in food molecules are used in organisms, and identify the biological processes that cycle carbon and energy within Earth systems.	Students can use models to explain the transformation in plants of light into chemical energy, use models to explain how matter and energy found in food molecules are used in organisms, and model the biological processes that cycle carbon and energy within Earth systems.	Students can use models and data to explain the transformation in plants of light into chemical energy, evaluate models that explain how matter and energy found in food molecules are used in organisms, and collect evidence to model the biological processes that cycle carbon and energy within Earth systems.
Target C: Interdependent Relationships in Ecosystems	Students can describe factors affecting biodiversity and ecosystem populations, identify physical or biological changes that affect ecosystem conditions and stability, and identify a design that minimizes human impacts on the environment and biodiversity.	Students can use mathematical representations to explain factors affecting biodiversity and ecosystem populations, evaluate evidence of complex physical or biological changes that affect ecosystem conditions and stability, and evaluate designs that minimize human impacts on the environment and biodiversity.	Students can analyze data and use mathematical representations to explain factors affecting biodiversity and ecosystem populations, gather and evaluate evidence of complex physical or biological changes that affect ecosystem conditions and stability, and evaluate and communicate designs that minimize human impacts on the environment and biodiversity.

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Target D: Inheritance and Variation of Traits	Students can recognize differences in the complexity of organisms caused by cellular divisions, make a claim about the causes of inheritable genetic variation, and use DNA data to describe genetic variation in individuals and in populations.	Students can use models to explain differences in the complexity of organisms caused by cellular divisions, use evidence to make and defend a claim about the causes of inheritable genetic variation, and use DNA data to defend a claim with evidence for the cause of genetic variation in individuals and in populations.	Students can use models and data to explain differences in the complexity of organisms caused by cellular divisions, use evidence and models to make and defend a claim about the causes of inheritable genetic variation, and use DNA data to evaluate evidence for the cause of genetic variation in individuals and in populations.
Target E: Natural Selection and Evolution	Students can describe ecological and genetic factors related to evolutionary processes, describe the adaptation of populations through natural selection, and describe environmental changes that affect species populations over time.	Students can use evidence to explain that ecological and genetic factors result in evolutionary processes, use evidence to support the adaptation of populations through natural selection, and evaluate evidence that environmental changes affect species populations over time.	Students can evaluate evidence for ecological and genetic factors that result in evolutionary processes, use models and evidence to support the adaptation of populations through natural selection, and collect and evaluate evidence that environmental changes affect species populations over time.
Target F: Engineering Design in Life Science	Students can identify that engineering problems can be broken down into smaller problems, identify the needs and trade-offs of an engineering design, and identify the most appropriate solution to a design problem.	Students can design solutions to smaller problems in the context of a larger problem; use prioritized needs and trade-offs of an engineering design to evaluate a complex, real-world problem to prioritize; and use models to explain the most appropriate solution to a design problem.	Students can evaluate solutions to smaller problems in the context of a larger problem; use prioritized needs and trade-offs of an engineering design to optimize a solution to a complex, real-world problem; and evaluate models to argue for the most appropriate solution to a design problem.

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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 they 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 they 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 they 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 the relationship between star properties and released energy, summarize the big bang theory, and describe the present orbital motions of objects in the solar system.	Students can develop a model to explain the relationship between star properties and released energy, use astronomical evidence to support the big bang theory, and use mathematical representations to predict orbital motions of objects in the solar system.	Students can use evidence and models to explain the relationship between star properties and released energy, synthesize astronomical evidence to support the big bang theory, and use mathematical representations and models to explain predictions of orbital motions of objects in the solar system.
Target B: History of Earth	Students can use tectonic-plate movements to describe the relative ages of different materials on Earth, identify data used to describe Earth's formation or early history, and describe how physical processes on Earth's surface and within Earth shape Earth's features over time and space.	Students can using tectonic-plate movements to evaluate evidence for the ages of different materials on Earth, use physical evidence to explain Earth's formation or early history , and use models to explain how physical processes on Earth's surface and within Earth shape Earth's features over time and space.	Students can use tectonic-plate movements and models to evaluate evidence for the ages of different materials on Earth, use physical evidence to support an argument about Earth's formation or early history, and 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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Target C: Earth's Systems	Students can identify a feedback cycle in Earth's systems, describe the carbon cycle within the four Earth spheres, and describe the effects of the water cycle on Earth's systems.	Students can analyze data to claim that Earth's systems are connected through feedback cycles, develop a quantitative model to describe the carbon cycle within the four Earth spheres, and plan an investigation of the effects of the water cycle on Earth's systems.	Students can analyze data to support an argument that Earth's systems are connected through feedback cycles, develop and use a quantitative model to describe the carbon cycle within the four Earth spheres, and use data from investigations to evaluate and model the effects of the water cycle on Earth's systems.
Target D: Weather and Climate	Students can describe the energy flow through Earth's systems related to the climate, and they can graph data to find changes in Earth's climate and related impacts to Earth's systems.	Students can use a model connecting the energy flow through Earth's systems to the climate and climatic changes, and they can analyze data to hypothesize future changes to Earth's climate and related impacts to Earth's systems.	Students can create a model connecting the energy flow through Earth's systems to the climate and climatic changes, and they can analyze data to hypothesize future changes and explain past changes to Earth's climate and related impacts to Earth's systems.
Target E: Human Sustainability	Students can describe the effects of natural resources or natural hazards on human activity, recognize the impacts of human use of natural resources, and describe a solution that reduces human impacts on natural systems	Students can use evidence to explain the effects of natural resources or natural hazards on human activity, evaluate cost–benefit design solutions for the use of natural resources, and evaluate or refine a solution that is designed to reduce human impacts on natural systems	Students can use evidence to support an argument about the effects of natural resources or natural hazards on human activity; evaluate and optimize cost–benefit design solutions for the use of natural resources; and evaluate, refine, and communicate solutions that reduce human impacts on natural systems

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Target F: Engineering Design in Earth and Space Science	Students can identify that engineering problems can be broken down into smaller problems, identify the needs and trade-offs of an engineering design, and identify the most appropriate solution to a design problem.	Students can design solutions to smaller problems in the context of a larger problem; use prioritized needs and trade-offs of an engineering design to evaluate a complex, real-world problem to prioritize; and use models to explain the most appropriate solution to a design problem.	Students can evaluate solutions to smaller problems in the context of a larger problem; use prioritized needs and trade-offs of an engineering design to optimize a solution to a complex, real-world problem; and evaluate models to argue for the most appropriate solution to a design problem.

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