

Science Content Emphases

The pattern of emphasis for the Targets that compose the Claims is adapted from the work of national assessment initiatives.

Individual standards, while important, are impossible to accurately measure with limited testing time. By assessing at the Target level, it is possible to highlight student comprehension of the connected material contained in the Standards. To capture the focus, coherence, and rigor of the Standards, it is necessary to vary the emphasis on particular Targets. All of the content is eligible for assessment, and the balance of tested content is derived from the expectations of the Standards.

The Claims are the broadest categories of knowledge, skills, and abilities that can have inferences drawn about them. Claims are built from domains of the Targets; Targets are drawn from the topics in the Standards. The evidence for each Target has been condensed from the expectations of student performance in the Standards.

The Goal Depth of Knowledge (an index of cognitive complexity) is provided as a general reference for the projected maximum DOK of items. Typically, items are at DOK 2 or 3 to compliment the performance expectations of the Standards. DOK 4 is generally reserved for complex tasks requiring data analysis.

The Relative Emphasis for each Target in each Claim is based on the work of the national assessment initiatives and the relative frequency with which items aligned to that Target would appear on a test. The Relative Emphasis should **NOT** be interpreted as a basis for making curricular decisions. Targets with a Low Relative Emphasis may include concomitant skills of other Medium or High Targets either in the same or different Claims within the same grade. These Targets may also be important foundational skills in a progression, and key to success in later grades.

Content Emphases for Grade 5

Claim (% of test)	Targets	Goal DOK	Relative Emphasis
1. Physical Science (35-40%)	A: Structure and Properties of Matter	3	High
	B: Engineering Design	3	Medium
2. Life Science (24-29%)	A: Matter and Energy in Organisms and Ecosystems	3	High
	B: Engineering Design	3	Low
3. Earth and Space Science (33-38%)	A: Earth's Systems	3	Medium
	B: Space Systems	3	Medium
	C: Engineering Design	3	Low

Grade 5, Claim 1 Targets

Target A	Use models to describe particles of matter, provide evidence that weight is conserved during changes in matter, identify materials based upon properties, and determine the formation of new substances by their properties.
Target B	Define problems with criteria and constraints, compare possible design solutions, and plan and carry out fair tests to improve a design.

Grade 5, Claim 2 Targets

Target A	Use models that describe energy in food, argue for materials needed by plants, and develop models of the movement of matter in ecosystems.
Target B	Define problems with criteria and constraints, compare possible design solutions, and plan and carry out fair tests to improve a design.

Grade 5, Claim 3 Targets

Target A	Use models to describe interactions between Earth systems, describe the distribution of water on Earth, and investigate ways communities protect resources and the environment.
Target B	Argue that gravity on Earth has a direction, argue for differences in brightness between the Sun and stars, and discover observable patterns due to the movement of the Earth and Moon.
Target C	Define problems with criteria and constraints, compare possible design solutions, and plan and carry out fair tests to improve a design.

Content Emphases for Grade 8

Claim (% of test)	Targets	Goal DOK	Relative Emphasis
1. Physical Science (34-38%)	A: Structure and Properties of Matter	3	Medium
	B: Chemical Reactions	4	Medium
	C: Forces and Interactions	3	Medium
	D: Energy	3	Medium
	E: Waves and Electromagnetic Radiation	3	Medium
	F: Engineering Design	4	Medium
2. Life Science (31-36%)	A: Structure, Function, and Information Processing	3	Medium
	B: Matter and Energy in Organisms and Ecosystems	3	High
	C: Interdependent Relationships in Ecosystems	3	Low
	D: Growth, Development, and Reproduction of Organisms	3	Medium
	E: Natural Selection and Adaptations	3	Medium
	F: Engineering Design	3	Low
3. Earth and Space Science (26-32%)	A: Space Systems	4	Medium
	B: History of Earth	3	Medium
	C: Earth's Systems	3	Medium
	D: Weather and Climate	3	Medium
	E: Human Impacts	4	Low
	F: Engineering Design	3	Low

Grade 8, Claim 1 Targets

Target A	Develop models of simple molecules, describe the development of synthetic materials, and develop models to describe changes in thermal energy of substances.
Target B	Investigate chemical reactions using changes in properties, develop models of chemical reactions with conserved mass, and evaluate devices using chemical reactions to change thermal energy.
Target C	Solve problems involving two colliding objects, provide evidence for the sum of forces on objects, determine factors affecting electric and magnetic forces, investigate gravitational interactions, and investigate forces acting at a distance.
Target D	Describe factors affecting kinetic energy, develop models of potential energy in objects interacting at distances, design devices concerning thermal energy transfer, investigate energy transfer and temperature of particles, and argue for energy conservation during kinetic energy changes.
Target E	Describe simple models of waves, model interactions of waves with materials, and support an argument for digital signal reliability.
Target F	Define a successful design solution with criteria and constraints, evaluate design solutions, analyze data to improve designs, and develop models to generate data to optimize designs or processes.

Grade 8, Claim 2 Targets

Target A	Provide evidence that living things are made of cells, develop models of cell function, provide evidence for the interaction of groups of cells, and synthesize information of the brain's processing sensory stimuli.
Target B	Explain the role of photosynthesis in matter and energy cycling, model the role of food molecules

	though chemical reactions in organisms, provide evidence of the effects of resources on organisms, model the cycling of matter among living and nonliving parts of ecosystems, and provide evidence that changes to ecosystems affect populations.
Target C	Explain patterns of interactions among organisms and evaluate designs to maintain biodiversity and ecosystems.
Target D	Explain how animal behaviors and plant structures affect reproduction, provide evidence of the influences on organism growth, describe effects of mutations on structure and function of organisms, model genetic variation of sexual and asexual reproduction, and synthesize information on technologies that influence desired traits.
Target E	Analyze patterns of change in life forms throughout the fossil record, construct explanations of similarities and differences among organisms, and compare the anatomy of embryos and adult species.
Target F	Define a successful design solution with criteria and constraints, evaluate design solutions, analyze data to improve designs, and develop models to generate data to optimize designs or processes.

Grade 8, Claim 3 Targets

Target A	Use models of cyclical patterns of the Earth-sun-moon system, model the role of gravity in galaxies and the solar system, and determine scale properties of solar system objects.
Target B	Explain Earth's history using rock strata evidence, explain how geoscience processes have changed Earth's surface, and analyze data of fossils and rocks for past plate motions.
Target C	Use models of the cycling of Earth's materials and energy, develop models of the cycling of Earth's

	water, and explain how geoscience processes produce uneven distribution of Earth's resources.
Target D	Provide evidence that air mass interactions change weather conditions, model patterns of atmosphere and ocean circulation using heat and the rotation of the Earth, and analyze evidence of factors that cause global temperatures to rise.
Target E	Analyze data on natural hazards to predict or mitigate their effects, design methods to minimize or monitor human environmental effects, and argue that human population growth impacts Earth's systems.
Target F	Define a successful design solution with criteria and constraints, evaluate design solutions, analyze data to improve designs, and develop models to generate data to optimize designs or processes.

Content Emphases for Grade 11

Claim (% of test)	Targets	Goal DOK	Relative Emphasis
1. Physical Science (27-33%)	A: Structure and Properties of Matter	3	Medium
	B: Chemical Reactions	4	Medium
	C: Forces and Interactions	4	Medium
	D: Energy	3	Medium
	E: Waves	3	Medium
	F: Engineering Design	4	Low
2. Life Science (34-40%)	A: Structure and Function	3	Medium
	B: Matter and Energy in Organisms and Ecosystems	3	Medium
	C: Interdependent Relationships in Ecosystems	4	Medium
	D: Inheritance and Variation of Traits	3	Medium
	E: Natural Selection and Evolution	3	Medium
	F: Engineering Design	3	Medium
3. Earth and Space Science (27-33%)	A: Space Systems	4	Medium
	B: History of Earth	3	Medium
	C: Earth's Systems	3	Medium
	D: Weather and Climate	3	Low
	E: Human Sustainability	3	Low
	F: Engineering Design	4	Medium

Grade 11, Claim 1 Targets

Target A	Model properties of elements using the periodic table, compare the structures of substances to infer the electrical forces between particles, develop models of nuclear processes, and explain the molecular structures of designed materials.
Target B	Explain simple chemical reactions using patterns of chemical properties, develop models of energy changes in bonds during reactions, explain the effects of temperature and concentration on reactions, design a chemical system that changes equilibrium products, and support claims of mass conservation during reactions.
Target C	Support the claim that force is related to mass and acceleration, support the claim that momentum is conserved with no net force on a system, design a device that minimize the forces in collisions, describe gravitational and electrostatic forces mathematically, and investigate the relationship between electric and magnetic fields.
Target D	Model the changes in energy of a known system, develop a model of energy associating motion and object or particle positions, design a device that converts one energy form into another, investigate thermal energy transfer in a closed system, and develop a model of interacting objects in electric or magnetic fields.
Target E	Support claims about waves traveling through media using mathematical representations, explain digital information transmission and storage, compare evidence for wave or particle models of light, explain the effects of electromagnetic radiation absorption on matter, and explain how waves transmit and capture information and energy.
Target F	Analyze design problems with criteria and constraints, develop design solutions by breaking

	down larger problems, evaluate designs using criteria or trade-offs, and develop models to predict impacts of proposed solutions.
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Grade 11, Claim 2 Targets

Target A	Provide evidence that DNA determines protein structure and function, develop models of interacting systems within organisms, and provide evidence that feedback systems maintain homeostasis.
Target B	Model photosynthetic transformations of light into chemical energy, explain the formation of large organic molecules from sugar molecules, explain how energy is transferred when bonds in food molecules are broken, explain how matter and energy are cycled in aerobic and anaerobic respiration, support the claim that matter and energy cycle in ecosystems with math, and model carbon cycling among Earth's systems.
Target C	Explain the factors affecting carrying capacity quantitatively, support evidence of factors affecting biodiversity mathematically, explain the interactions influencing the stability of ecosystems, design and evaluate solutions to limit human impacts on the environment and biodiversity, and provide evidence of group behavior affecting reproduction.
Target D	Model mitotic division and differentiation in organisms, explain the role of DNA to inheritance of traits, provide evidence for factors resulting in heritable genetic variation, and explain the variation of population traits statistically.
Target E	Use multiple lines of evidence in explanations of evolution, provide evidence of factors in the evolution process, explain the increase of advantageous traits statistically, explain adaptation

	of populations using natural selection, and support claims that changing environments affect species.
Target F	Analyze design problems with criteria and constraints, develop design solutions by breaking down larger problems, evaluate designs using criteria or trade-offs, and develop models to predict impacts of proposed solutions.

Grade 11, Claim 3 Targets

Target A	Use models to explain the role of nuclear fusion in the Sun, use multiple lines of evidence to support the Big Bang theory, explain how stars produce elements, and predict the motion of orbiting objects mathematically.
Target B	Explain the ages of rocks using plate tectonic theory, provide evidence of Earth's formation and early history, and develop a model of Earth's processes to explain surface features.
Target C	Argue for feedback cycles changing Earth systems, model the cycling of Earth's interior by thermal convection, investigate the effects of water on Earth's systems, describe carbon cycling quantitatively, and argue with evidence for coevolution of Earth's systems and life.
Target D	Model changes in climate using energy flow variations and provide evidence that global climate models forecast future changes to Earth systems.
Target E	Explain how human activity is influenced by natural resources and hazards, compare design solutions to use energy or mineral resources, illustrate relationships among natural resources, humans, and biodiversity, evaluate solutions to reduce human environmental impacts, and represent relationships among Earth systems modified by human activity.

Target F	Analyze design problems with criteria and constraints, develop design solutions by breaking down larger problems, evaluate designs using criteria or trade-offs, and develop models to predict impacts of proposed solutions.
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