

Appendix C
CMAS Science
Prepared Graduate Competencies and
Grade Level Expectations

Grade 8 Science
Standards, Prepared Graduate Competencies, and Grade Level Expectations

1	Physical Science
PGC 1	Observe, explain, and predict natural phenomena governed by Newton's laws of motion, acknowledging the limitations of their application to very small or very fast objects
GLE 1	Identify and calculate the direction and magnitude of forces that act on an object, and explain the results in the object's change of motion
PGC 2	Apply an understanding that energy exists in various forms, and its transformation and conservation occur in processes that are predictable and measurable
GLE 2	There are different forms of energy, and those forms of energy can be changed from one form to another— but total energy is conserved
GLE 4	Recognize that waves such as electromagnetic, sound, seismic, and water have common characteristics and unique properties
PGC 3	Apply an understanding of atomic and molecular structure to explain the properties of matter, and predict outcomes of chemical and nuclear reactions
GLE 3	Distinguish between physical and chemical changes, noting that mass is conserved during any change
2	Life Science
PGC1	Explain and illustrate with examples how living systems interact with the biotic and abiotic environment
GLE 1	Human activities can deliberately or inadvertently alter ecosystems and their resiliency
PGC 2	Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment
GLE 2	Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals' traits in the next generation
3	Earth Systems Science
PGC 1	Evaluate evidence that Earth's geosphere, atmosphere, hydrosphere, and biosphere interact as a complex system
GLE 1	Weather is a result of complex interactions of Earth's atmosphere, land and water, that are driven by energy from the sun, and can be predicted and described through complex models
GLE 2	Earth has a variety of climates defined by average temperature, precipitation, humidity, air pressure, and wind that have changed over time in a particular location
PGC 2	Describe and interpret how Earth's geologic history and place in space are relevant to our understanding of the processes that have shaped our planet
GLE 3	The solar system is comprised of various objects that orbit the Sun and are classified based on their characteristics
GLE 4	The relative positions and motions of Earth, Moon, and Sun can be used to explain observable effects such as seasons, eclipses, and Moon phases

**High School Science
Standards, Prepared Graduate Competencies, and Grade Level Expectations**

1	Physical Science
PGC 1	Observe, explain, and predict natural phenomena governed by Newton's laws of motion, acknowledging the limitations of their application to very small or very fast objects
GLE 1	Newton's laws of motion and gravitation describe the relationships among forces acting on and between objects, their masses, and changes in their motion – but have limitations
PGC 2	Apply an understanding of atomic and molecular structure to explain the properties of matter, and predict outcomes of chemical and nuclear reactions
GLE 2	Matter has definite structure that determines characteristic physical and chemical properties
GLE 3	Matter can change form through chemical or nuclear reactions abiding by the laws of conservation of mass and energy
GLE 4	Atoms bond in different ways to form molecules and compounds that have definite properties
PGC 3	Apply an understanding that energy exists in various forms, and its transformation and conservation occur in processes that are predictable and measurable
GLE 5	Energy exists in many forms such as mechanical, chemical, electrical, radiant, thermal, and nuclear, that can be quantified and experimentally determined
GLE 6	When energy changes form, it is neither created nor destroyed; however, because some is necessarily lost as heat, the amount of energy available to do work decreases
2	Life Science
PGC1	Explain and illustrate with examples how living systems interact with the biotic and abiotic environment
GLE 1	Matter tends to be cycled within an ecosystem, while energy is transformed and eventually exits an ecosystem
GLE 2	The size and persistence of populations depend on their interactions with each other and on the abiotic factors in an ecosystem
PGC 2	Analyze the relationships between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection
GLE 3	Cellular metabolic activities are carried out by biomolecules produced by organisms
GLE 4	The energy for life primarily derives from the interrelated processes of photosynthesis and cellular respiration. Photosynthesis transforms the sun's light energy into the chemical energy of molecular bonds. Cellular respiration allows cells to utilize chemical energy when these bonds are broken.
GLE 5	Cells use passive and active transport of substances across membranes to maintain relatively stable intracellular environments
GLE 6	Cells, tissues, organs, and organ systems maintain relatively stable internal environments, even in the face of changing external environments
PGC3	Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment
GLE 7	Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins

GLE 8	Multicellularity makes possible a division of labor at the cellular level through the expression of select genes, but not the entire genome.
PGC4	Explain how biological evolution accounts for the unity and diversity of living organisms
GLE 9	Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment
3	Earth Systems Science
PGC 1	Describe and interpret how Earth’s geologic history and place in space are relevant to our understanding of the processes that have shaped our planet
GLE 1	The history of the universe, solar system and Earth can be inferred from evidence left from past events
GLE 2	As part of the solar system, Earth interacts with various extraterrestrial forces and energies such as gravity, solar phenomena, electromagnetic radiation, and impact events that influence the planet’s geosphere, atmosphere, and biosphere in a variety of ways
PGC 2	Evaluate evidence that Earth’s geosphere, atmosphere, hydrosphere, and biosphere interact as a complex system
GLE 3	The theory of plate tectonics helps explain geological, physical, and geographical features of Earth
GLE 4	Climate is the result of energy transfer among interactions of the atmosphere, hydrosphere, geosphere, and biosphere
GLE 6	The interaction of Earth's surface with water, air, gravity, and biological activity causes physical and chemical changes
GLE 7	Natural hazards have local, national and global impacts such as volcanoes, earthquakes, tsunamis, hurricanes, and thunderstorms
PGC 3	Describe how humans are dependent on the diversity of resources provided by Earth and Sun
GLE 5	There are costs, benefits, and consequences of exploration, development, and consumption of renewable and nonrenewable resources