***General MCAS Achievement Level Descriptors***

**Exceeding Expectations**   
A student who performed at this level exceeded grade-level expectations by demonstrating mastery of the subject matter.

**Meeting Expectations**   
A student who performed at this level met grade-level expectations and is academically on-track to succeed in the current grade in this subject.

**Partially Meeting Expectations**A student who performed at this level partially met grade-level expectations in this subject. The school, in consultation with the student’s parent/guardian, should consider whether the student needs additional academic assistance to succeed in this subject.

**Not Meeting Expectations**A student who performed at this level did not meet grade-level expectations in this subject. The school, in consultation with the student’s parent/guardian, should determine the coordinated academic assistance and/or additional instruction the student needs to succeed in this subject.

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations, Meeting Expectations, Partially Meeting Expectations,* and *Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. **Knowledge and skills are cumulative at each level.** No descriptors are provided for the *Not Meeting Expectations* achievement level because students work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Partially Meeting Expectations *On MCAS, a student at this level:*** | **Meeting Expectations  *On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| **Understanding and Application of Disciplinary Core Ideas** | Demonstrates a partial understanding of some scientific concepts and processes by identifying and sometimes describing or providing evidence for these concepts and processes.  Uses some basic scientific terms in common scientific examples. | Demonstrates a solid understanding of many scientific concepts and processes by mostly describing, explaining, and providing evidence for these concepts and processes.  Mostly applies appropriate scientific terms in a variety of applications, including common science examples and some novel situations. | Demonstrates a comprehensive, in-depth understanding of many scientific concepts and processes by consistently describing, explaining, and providing evidence for these concepts and processes.  Consistently applies scientific terms in appropriate contexts in both common science examples and many novel situations. |
| **Understanding and Application of Scientific and Engineering Practices** | Identifies a testable, scientific question for an investigation.  Completes a simple, commonly used model.  Uses simple graphs or data to draw general conclusions about a familiar scientific investigation or phenomena.  Identifies evidence to support a claim.  Describes a benefit or drawback of simple design features given a familiar device or prototype. | Develops some testable, scientific questions for an investigation.  Completes or uses a model and describes some strengths and weaknesses of the model.  Analyzes multiple sources of data, including graphs and tables, to draw conclusions about a familiar scientific investigation or phenomena.  Provides some evidence to support a claim and constructs basic explanations for scientific phenomena or results from an investigation.  Analyzes design features of a familiar device or prototype and describes a benefit or drawback of the design. | Consistently develops testable, scientific questions for an investigation.  Creates a model, consistently describes the strengths and weaknesses of the model, and provides information for how to improve the model.  Analyzes multiple sources of data, including graphs and tables, to draw conclusions about a novel or complex scientific investigation or phenomena.  Provides several pieces of evidence to support a claim and constructs thorough explanations for scientific phenomena or results from an investigation.  Analyzes design features of a novel device or prototype and constructs an explanation for how the design features meet criteria for success or are limited by constraints. |

|  |  |  |
| --- | --- | --- |
| **LS1. From Molecules to Organisms: Structures and Processes** | | |
| **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| Identifies some of the most common elements that make up organic macromolecules.  Describes a basic function of a type of organic macromolecule (carbohydrate, lipid, nucleic acid, or protein).  Identifies the source of energy and the major reactants and products of photosynthesis by their names or chemical formulas.  Describes ATP as a source of usable energy and that it is produced in mitochondria.  Describes some major events of the cell cycle (including interphase, mitosis, cytokinesis) and their purposes.  Recognizes that chromosomes are separated during mitosis and that mitosis is responsible for tissue growth and repair.  Identifies complementary base pairs for a DNA sequence and for an mRNA sequence.  Identifies that a gene codes for a protein and describes one function of a protein.  Completes a basic model to generally describe how a body system works.  Describes one way the body maintains homeostasis. | Analyzes models to classify most organic macromolecules and identifies all common elements for a given example.  Analyzes models of monomers to identify some types of organic macromolecules and describes some basic functions of these macromolecules.  Constructs or completes models of photosynthesis using the names or chemical formulas of reactants and products and describes the importance of photosynthesis.  Constructs or completes models of cellular respiration using the names or chemical formulas of reactants and products and describes the importance of cellular respiration.  Completes a model to describe how major events of the cell cycle, including DNA replication, allow a cell to grow and survive.  Describe the number of chromosomes in a body cell and its daughter cells.  Describes the structure of DNA and how its structure affects its function.  Describes how genes code for proteins through transcription and translation and describes several functions of proteins.  Recognizes that all cells within the same organism have the same genes.  Describes several functions of proteins.  Describes the functions of structures and organs of body systems.  Interprets models to draw a conclusion about the way the human body maintains homeostasis. | Analyzes models of monomers to consistently identify their organic macromolecules and describes the functions of these molecules.  Constructs an explanation about the important uses of the products of photosynthesis for both plants and animals.  Analyzes data to determine the relative amount of ATP that is generated by organisms under different conditions.  Explains how ATP is used in a variety of ways by both animal and plant cells.  Constructs an explanation about how the sequence of events of the cell cycle allows organisms to grow and survive.  Explains the importance of mitosis and cytokinesis in an organism.  Describes specific functions of several proteins, including enzymes, hormones, and structural proteins.  Calculates the percentage of one type of nitrogenous base for a DNA molecule using complementary base pairs.  Analyzes and creates models of DNA, RNA, and amino acid chains to describe the products of replication, transcription, or translation.  Analyzes data to determine when a gene is expressed and to determine whether replication, transcription, or translation occurs.  Constructs an explanation about why different types of cells express different genes, which results in different cell functions.  Analyzes data to draw conclusions about how body systems work together to support life functions.  Constructs an explanation about how body systems work to restore homeostasis through a sequence of events. |

|  |  |  |
| --- | --- | --- |
| **LS2. Ecosystems: Interactions, Energy, and Dynamics** | | |
| **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| Describes birth and immigration as factors that increase population size, and death and emigration as factors that decrease population size.  Identifies some basic ecological relationships (such as predation, competition, mutualism), when given an example.  Interprets a basic food web to identify simple ecological relationships.  Analyzes a food web to identify the trophic level of a species.  Recognizes that less energy is available at higher tropic levels in an energy pyramid.  Identifies some carbon cycle processes and recognizes that carbon is released or stored in the environment depending on the process.  Recognizes that the biodiversity of an ecosystem is affected by the number of species in the ecosystem.  Identify some characteristics of invasive species.  Describes one way invasive species can impact other species in an ecosystem.  Identifies human impacts (climate change, pollution, habitat destruction) on an ecosystem and describes some ways to address them. | Describes how various biotic and abiotic factors affect a population’s birth rate, death rate, immigration rate, or emigration rate.  Describes several ecological relationships and determines evidence that supports claims about ecological relationships.  Analyzes a food web to describe changes to populations resulting from an increase or decrease of another population.  Uses an energy pyramid to calculate the amount of energy that is expected to be stored in different trophic levels.  Completes a carbon cycle model showing how carbon is moved through both biotic and abiotic parts of an ecosystem.  Describes how the biodiversity of an ecosystem is affected by the number of individuals within a species (genetic diversity is lower in smaller populations).  Describes how characteristics of invasive species can affect other species in an ecosystem.  Analyzes data to determine the human impact on an ecosystem and describes several ways to reduce the impact of human activity on the ecosystem. | Analyzes multiple factors (such as species interactions, human activities, and natural phenomena) to solve problems relating to population size and carrying capacity of an ecosystem.  Analyzes complex food webs and constructs explanations about various interactions in the food web as the sizes of populations change.  Constructs an explanation for why only about 10% of the energy stored in one trophic level will be available to the next higher trophic level and how having less energy available reduces the number of organisms that can be supported at higher trophic levels.  Constructs an explanation for how several carbon cycle processes interact within an ecosystem and how changes in the environment can disrupt the cycle.  Explains how biodiversity of an ecosystem can be impacted by both the number of species in that ecosystem as well as the number of individuals within a species.  Constructs thorough explanations for how and why invasive species can affect an ecosystem.  Evaluates several solutions for either reducing the impact of human activity on an ecosystem or restoring an ecosystem and explains the benefits and drawbacks of these solutions. |

|  |  |  |
| --- | --- | --- |
| **LS3. Heredity** | | |
| **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| Identifies the general purpose of meiosis, that gametes come from two parents, and that egg and sperm combine to produce offspring.  Recognizes that inherited traits are a result of genetic information encoded in an organism’s DNA and RNA.  Completes a simple model to show how a mutation in a DNA sequence can change an mRNA codon.  Identifies that only mutations in a gamete can be passed from parent to offspring and that mutations can be a source of genetic diversity.  Interprets information to determine when traits show dominant-recessive and codominant inheritance patterns.  Identifies genotypes for a certain trait, completes a Punnett square for a given cross, and calculates the expected percentage of offspring for a given genotype or phenotype.  Identifies the genotype of an individual in a basic pedigree when the inheritance pattern is given. | Analyzes and completes a basic model of meiosis.  Describes the product of fertilization as a zygote (a diploid cell) containing genetic information from both parents.  Describes how mutations in DNA can lead to the production of different amino acids and therefore different proteins.  Interprets a model of crossing over and concludes that genetic variability increases as a result of crossing over.  Interprets information to describe how a trait is inherited by incomplete dominance, sex-linked, multiple alleles, and polygenic inheritance patterns.  Constructs and completes Punnett squares and calculates the expected percentages of genotypes and phenotypes of crosses for a given scenario.  Analyzes a pedigree to determine the inheritance pattern of a trait.  Describes how environmental factors can influence the expression of some inherited traits. | Constructs an explanation of why meiosis is important for maintaining the number of chromosomes from one generation to the next.  Explains how crossing over, independent assortment, and random pairing of gametes contribute to the genetic diversity of offspring.  Constructs an explanation for how a mutation in a DNA code may or may not result in a phenotypic (trait) change.  Analyzes Punnett squares to determine the expected genotype and phenotype percentages for sex-linked traits.  Analyzes a complex pedigree to determine genotypes and phenotypes of individuals and to make predictions about future offspring of parents in the pedigree.  Uses data to explain the likelihood that a certain trait will be more influenced by genetics or by the environment. |

|  |  |  |
| --- | --- | --- |
| **LS4. Evolution** | | |
| **Partially Meeting Expectations**  ***On MCAS, a student at this level:*** | **Meeting Expectations**  ***On MCAS, a student at this level:*** | **Exceeding Expectations**  ***On MCAS, a student at this level:*** |
| Identifies some types of evidence (genomes, amino acids, fossils, homologous structures) that support the process of evolution.  Recognizes that individuals with certain traits survive and produce more offspring than individuals without those traits.  Describes that, in general, two organisms from the same species are able to mate and produce offspring.  Recognizes that isolated populations generally have a smaller gene pool than larger populations.  Recognizes that viruses are unable to reproduce outside of a host cell and that bacteria reproduce through asexual reproduction. | Explains how evolution can be supported by evidence that demonstrates common ancestry.  Completes a cladogram to show the evolutionary relationships among several species.  Describes how an advantageous heritable trait allows individuals in a population to survive and reproduce more than individuals without that trait.  Describes how to determine whether two organisms are closely related and/or from the same species.  Describes the role of genetic drift or gene flow in the speciation or extinction of a population.  Describes how bacteria and viruses adapt quickly to changing environments due to their high mutation rate and the ability to quickly reproduce. | Constructs an explanation based on a model, such as a cladogram, to support a claim about the evolutionary relatedness of species and explains why comparing genomes provides the best evidence that two species are closely related.  Constructs a thorough explanation about evolution, including conditions (heritable variation, differential fitness) that need to be met for evolution to occur and how there will be changes in the frequency of alleles (or traits) within a population over time.  Analyzes a situation to determine evidence of selection pressures that could influence the evolution of a population.  Constructs explanations based on data for how genetic drift, gene flow, mutations, and natural selection can play a role in the speciation or extinction of a population.  Analyzes the results of an investigation to determine conditions that will support the growth of bacteria or viruses. |