

## High School MCAS Biology Performance Level Descriptors

Student results on the MCAS tests are reported according to four performance levels: *Advanced*, *Proficient*, *Needs Improvement*, and *Warning/Failing*. The descriptors in this document illustrate the kinds of knowledge and skills students demonstrate on MCAS at each level. **Knowledge and skills are cumulative at each level.** No descriptors are provided for the *Warning/Failing* performance level because student work at this level, by definition, falls below the criteria of the *Needs Improvement* level.

<b>Chemistry of Life</b>		
<b>Needs Improvement</b>	<b>Proficient</b>	<b>Advanced</b>
<p>Identifies some of the most common elements found in organisms and the four biologically important categories of molecules</p> <p>Describes the basic purpose of an enzyme</p>	<p>Identifies the six most common elements found in organisms and describes how very few elements make up the structure of biological molecules</p> <p>Classifies organic molecules into one of the four biologically important categories and describes some basic functions of these molecules</p> <p>Describes the function of enzymes and identifies some factors that have an effect on enzymes</p>	<p>Describes the functions of carbohydrates, lipids, proteins, and nucleic acids and relates their structures to functions</p> <p>Explains the effects enzymes can have on biological processes and how environments can have an effect on the activity of enzymes</p>

**Cell Biology**

<b>Needs Improvement</b>	<b>Proficient</b>	<b>Advanced</b>
<p>Identifies most cell parts/organelles and describes some of their functions</p> <p>Recognizes the basic difference between diffusion (no energy required) and active transport (energy required)</p> <p>Identifies examples of organisms within most of the kingdoms and classifies them as prokaryotic or eukaryotic</p> <p>Identifies the basic purposes of photosynthesis and cellular respiration and identifies their products</p> <p>Identifies examples of mitosis and meiosis; distinguishes between sexual reproduction and asexual reproduction</p> <p>Recognizes that gametes are involved in fertilization and that zygotes are a result of this process</p> <p>Recognizes that viruses are unable to reproduce without a host cell</p>	<p>Describes the functions of organelles within the cell and describes various forms of cell membrane transport</p> <p>Describes general characteristics of prokaryotes and eukaryotes and describes how organisms are grouped into kingdoms</p> <p>Differentiates between photosynthesis and cellular respiration; identifies their reactants and products</p> <p>Describes how mitosis is a primary means of reproduction in asexual organisms and is also used in growth/repair of cells; describes how the purpose of meiosis is to produce sex cells with half the genetic material</p> <p>Describes the process of fertilization and its products</p> <p>Describes the general structure and reproductive process for viruses</p>	<p>Describes the makeup of a cell membrane and explains its role as a highly selective barrier</p> <p>Explains the classification of organisms based on cellular evidence and modes of nutrition</p> <p>Explains the relationship between photosynthesis and cellular respiration and writes equations for each reaction</p> <p>Compares and contrasts meiosis and mitosis, including their roles in growth and reproduction</p> <p>Explains how viruses differ from cellular organisms in structure, function, and reproductive machinery</p>

**Genetics**

<b>Needs Improvement</b>	<b>Proficient</b>	<b>Advanced</b>
Identifies the basic structure (double helix, sugar/phosphate backbone, linked by complementary nucleotide pairs) of DNA and describes DNA as a carrier of genetic information in organisms	Describes the basic structure of DNA and its function in genetic inheritance, and describes the semi-conservative nature of DNA replication; describes the flow of information from DNA to RNA to protein	Explains how the physical structure of DNA relates to its replication and explains the processes of transcription and translation and the resulting expression of genes
Identifies basic purposes of replication, transcription, and translation	Identifies processes that can lead to genetic mutations and recognizes that mutations may or may not result in phenotypic change	Explains how a mutation may or may not result in a phenotypic change
Identifies examples of genetic mutations	Identifies different inheritance patterns	Describes how various inheritance patterns can affect offspring produced from a given genetic cross
Distinguishes between dominant and recessive traits and completes partial Punnett squares for monohybrid crosses	Distinguishes between Mendel's laws of segregation and independent assortment	Describes how independent assortment and segregation can be observed through different types of crosses
Identifies examples of segregation and independent assortment	Produces Punnett squares and calculates genotype and phenotype ratios for monohybrid crosses	

**Anatomy and Physiology**

<b>Needs Improvement</b>	<b>Proficient</b>	<b>Advanced</b>
Identifies most of the major organs and structures of the digestive, circulatory, respiratory, nervous, and muscular/skeletal systems, and relates some structures to function	Describes functions of major organs and structures of the digestive, circulatory, respiratory, nervous, and muscular/skeletal systems and describes basic functions of the kidneys and liver	Describes overall functions of the digestive, circulatory, respiratory, nervous, and muscular/skeletal systems with major organs/structures and functions of those organs/structures; describes how the kidneys and liver are associated with the circulatory system
Recognizes that sexual reproduction produces offspring composed of genetic information from both parents	Explains why offspring produced from sexual reproduction will resemble the parents, but will not be identical to the parents	Relates cell communication to types of cells and their functions
Identifies examples of homeostasis	Describes different ways that cells can communicate	Explains various ways the body maintains homeostasis and describes the function of a feedback loop
Identifies the importance of the nervous and endocrine systems in cellular communication	Identifies various ways the body maintains homeostasis and recognizes a feedback loop	

<b>Evolution and Biodiversity</b>		
<b>Needs Improvement</b>	<b>Proficient</b>	<b>Advanced</b>
<p>Identifies various types of evidence that demonstrate evolution</p> <p>Describes species as reproductively distinct groups of organisms</p> <p>Lists the taxonomic hierarchy from kingdom to species</p> <p>Recognizes that favorable traits will allow certain individuals in a population to survive and reproduce better than others</p>	<p>Describes how various types of evidence demonstrate evolution; interprets diagrams that show the evolution of organisms</p> <p>Describes the hierarchical relationships within the taxonomic system</p> <p>Describes various conditions that could lead to speciation within a population</p> <p>Describes how a natural selection process could affect the genetic diversity of a population</p>	<p>Analyzes situations relating to evolution through natural selection and uses evidence from the fossil record, molecular biology, etc., to demonstrate changes in biodiversity over time</p>

**Ecology**

<b>Needs Improvement</b>	<b>Proficient</b>	<b>Advanced</b>
Identifies that birth and immigration increase population size, while death and emigration decrease it	Describes how various events and conditions could affect population size or biodiversity	Solves complex problems relating to population size and biodiversity; analyzes multiple factors (natural phenomena, human intervention, inter-organism relationships, etc.) and interprets and/or creates energy pyramids and food webs
Identifies factors that influence population size or biodiversity	Describes how multiple factors may interact to affect population size or biodiversity	
Identifies the correct trophic level for a member of a food web	Explains energy relationships among members of a food web	Explains relationships among various nutrient cycles
Identifies the relationship between two organisms in an ecosystem	Describes how various biotic and abiotic processes (photosynthesis, evaporation, nitrogen fixation, etc.) help maintain nutrient cycles	
Describes basic nutrient cycles and can identify some components of a cycle		