

High School MCAS Technology/Engineering 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.

Engineering Design		
Needs Improvement	Proficient	Advanced
Identifies and describes most of the steps in the engineering design process and recognizes that it is intended to improve processes and solve problems	Identifies all of the steps in the engineering design process, describes most of them, and describes generally how the process contributes to solving design problems	Identifies and describes all the steps in the engineering design process and explains how applying it improves processes and solves problems in specific examples
Identifies missing views in orthographic projections and identifies other types of drawings	Identifies and produces orthographic projections and other types of drawings and interprets scale and proportion on drawings with dimensions	Produces engineering drawings, identifying significant features of each type of drawing, and translates between two different types of drawings of an object; applies scale and proportion on drawings with dimensions
Recognizes that an object can be represented by a diagram or drawing and identifies the intended end use of the object	Interprets a plan or diagram of a model or a prototype and draws basic conclusions about its function and structure	Interprets a complex diagram or drawing of a model or prototype and explains the relationship of the model or prototype's structure and function

Construction Technologies		
Needs Improvement	Proficient	Advanced
Identifies and describes some material properties and stresses	Identifies and describes most material properties and stresses	Explains the relationships between engineering properties of materials and stresses, and applies this information to a given situation
Recognizes the difference between live loads and dead loads	Identifies effects of Bernoulli's principle on structures	Explains Bernoulli's principle and how it can apply to structures
Identifies some of the tools and procedures for completing a construction task safely and the general purpose of zoning laws and building codes	Calculates the resultant force for live loads and dead loads	Calculates the resultant forces for a complex combination of live loads and dead loads
	Describes in general how to complete a given construction task safely, and identifies examples of zoning laws and building codes in different situations	Describes in detail how to complete a given construction task using appropriate tools safely
		Compares and contrasts the purposes of zoning laws and building codes

**Energy and Power Technologies—
Fluid Systems**

Needs Improvement	Proficient	Advanced
<p>Differentiates between open and closed fluid systems, and hydraulic and pneumatic systems</p> <p>Recognizes that in a hydraulic system a force can be transmitted and the direction of a force can be changed</p> <p>Recognizes an inverse relationship between liquid velocity and pipe diameter, and identifies sources of resistance in pipe systems</p>	<p>Describes differences between open and closed fluid systems, and characteristics and properties of hydraulic and pneumatic systems</p> <p>Describes applications where force is multiplied or where distance is multiplied in a hydraulic system and when to apply each</p> <p>Determines how liquid velocity varies with changes in pipe diameter and describes sources of resistance in pipe systems</p>	<p>Explains how open and closed fluid systems function, and explains applications of hydraulic and pneumatic systems</p> <p>Explains quantitatively the relationship of pressure, force, and distance in a hydraulic system</p>

**Energy and Power Technologies—
Thermal Systems**

Needs Improvement	Proficient	Advanced
<p>Defines and identifies examples of conduction, convection, and radiation in a thermal system</p> <p>Identifies some environmental conditions that influence building design</p> <p>Identifies differences between renewable and nonrenewable energy systems</p>	<p>Describes heat transfer in thermal systems and identifies heat transfer requirements in various situations</p> <p>Selects appropriate materials when considering heat transfer</p> <p>Describes effects of the environment on structures</p> <p>Analyzes building designs and locations relevant to heating and cooling efficiency</p> <p>Describes some features of renewable energy systems</p>	<p>Explains how heat is transferred in various thermal systems and explains the relationships between properties of materials and heat transfer</p> <p>Proposes building designs and locations relevant to heating and cooling efficiency</p> <p>Compares advantages and disadvantages of various renewable energy systems</p>

**Energy and Power Technologies—
Electrical Systems**

Needs Improvement	Proficient	Advanced
<p>Calculates voltage, current, resistance, and power in simple problems</p> <p>Identifies a complete circuit and its components and the type of meter used to measure voltage, current, and resistance; identifies external factors that can affect resistance</p> <p>Differentiates between AC and DC</p>	<p>Interprets the relationship among current, voltage, power, and resistance in circuits and describes how to measure these in a circuit</p> <p>Describes the function of each component in a circuit and identifies situations in which temperature affects resistance</p> <p>Recognizes examples of uses for AC and DC</p>	<p>Analyzes series and parallel circuits consisting of common circuit elements and describes alternate ways of measuring current, voltage, power, and resistance</p> <p>Explains why one type of current (AC or DC) would be used over the other in a given situation and provides examples of each</p>

Communication Technologies		
Needs Improvement	Proficient	Advanced
<p>Recognizes that signals travel through different media and identifies digital and analog signals</p> <p>Identifies most and describes some components of a communication system</p> <p>Identifies applications that use laser and fiber optic technology and generally describes how fiber optic technology works</p>	<p>Describes how signals travel through a given medium and describes the signal used in a given communication device</p> <p>Identifies and describes functions of parts of a communication system</p> <p>Describes how electromagnetic signals are transmitted in fiber optic systems (including critical angle and total internal reflection) and describes fiber optic technology applications</p>	<p>Explains the nature of signals that travel through various media and the characteristics of digital and analog signals in communication systems</p> <p>Explains how components of a communication system work together</p>

Manufacturing Technologies		
Needs Improvement	Proficient	Advanced
Identifies some manufacturing processes and some of the criteria necessary to select procedures and tools	Describes most manufacturing processes and determines the appropriate manufacturing processes for products based on different manufacturing criteria	Describes manufacturing processes and provides examples of each. Explains why given criteria are necessary for selecting tools and procedures
Identifies some advantages in using robots in manufacturing processes	Explains the advantageous features of robotic systems	