Missouri End-of-Course Assessment Achievement Level Descriptors

Physical Science

Achievement Levels

**Advanced:** Students performing at the Advanced level on the Missouri Physical Science End-of Course Assessment demonstrate a thorough understanding of the course-level expectations for Physical Science. In addition to demonstrating, understanding, and applying the skills at the Proficient level, students scoring at the Advanced level use a range of strategies.

**Proficient:** Students performing at the Proficient level on the Missouri Physical Science End-of Course Assessment demonstrate an understanding of the course-level expectations for Physical Science. In addition to demonstrating, understanding, and applying the skills at the Basic level, students scoring at the Proficient level use a range of strategies.

**Basic:** Students performing at the Basic level on the Missouri Physical Science End-of-Course Assessment demonstrate a partial understanding of the course-level expectations for Physical Science. In addition to demonstrating, understanding, and applying the skills at the Below Basic level, students scoring at the Basic level use some strategies.

**Below Basic:** Students performing at the Below Basic level on the Missouri Physical Science End-of-Course Assessment demonstrate a limited understanding of the course-level expectations for Physical Science. In addition to demonstrating these skills, students scoring at the Below Basic level use very few strategies and demonstrate a limited understanding of important Physical Science content and concepts.
Achievement Descriptors

Advanced

In addition to understanding and applying the skills at the Proficient level, students at this level:

✓ Predict the effect of a temperature change on the pressure, volume, and density of a liquid or gas
✓ Describe how valence electrons determine how atoms interact and may bond
✓ Compare and contrast the types of chemical bonds
✓ Compare the mass of the reactants to the mass of the products in a chemical reaction or physical change as support for the Law of Conservation of Mass
✓ Describe how electromagnetic energy is transferred through space as electromagnetic waves of varying wavelength and frequency
✓ Describe how changes in the nucleus of an atom during a nuclear reaction result in emission of radiation
✓ Classify the different ways to store energy and describe the transfer of energy as it changes from kinetic to potential, while the total amount of energy remains constant, within a system
✓ Interpret graphic displays of an object’s motion in terms of speed, velocity, and acceleration using dimensional analysis
✓ Compare and describe the gravitational forces between two objects in terms of their masses and the distances between them
✓ Explain how the efficiency of a mechanical system can be expressed as a ratio of work output to work input
✓ Identify information that the electromagnetic spectrum provides about the stars and the universe
✓ Explain that the total momentum remains constant within a system
Proficient

In addition to understanding and applying the skills at the Basic level, students at this level:

✓ Compare the densities of regular and irregular objects using their respective measures of volume and mass
✓ Describe power in terms of work and time
✓ Compare and contrast the properties of acidic and basic solutions
✓ Predict the effect of pressure changes on the properties of a material
✓ Classify a substance as being made up of one kind of atom or a compound when given the structural and molecular formula for the substance
✓ Identify pure substances by their physical and chemical properties
✓ Using the Kinetic Theory model, explain the changes that occur in the distance between atoms/molecules and temperature of a substance as energy is absorbed or released
✓ Calculate the number of protons, neutrons, and electrons of an element given its mass number and atomic number
✓ Contrast various types of chemical bonds
✓ Explain the structure of the periodic table in terms of the elements with common properties
✓ Predict the chemical reactivity of elements using the Periodic Table
✓ Compare the mass of the reactants to the mass of the products in a physical change as support for the Law of Conservation of Mass
✓ Differentiate among thermal energy, heat, and temperature
✓ Interpret examples of heat transfer as convection, conduction, or radiation
✓ Identify and evaluate advantages/disadvantages of using various sources of energy for human activity
✓ Relate kinetic energy to an object’s mass and its velocity
✓ Compare the efficiency of two systems
✓ Relate an object’s gravitational potential energy to its weight and height relative to the surface of the Earth
✓ Describe the effect of work on an object’s kinetic and potential energy
✓ Describe the effect of different frequencies of electromagnetic waves on the Earth and living organisms
✓ Identify the role of nuclear energy as it serves as a source of energy for the Earth, stars, and human activity
✓ Describe weight in terms of the force of a planet’s or moon’s gravity acting on a given mass
✓ Compare the momentum of two objects in terms of mass and velocity
✓ Compare the gravitational forces between two objects in terms of their masses and the distances between them
✓ Describe the transfer of energy as it changes from kinetic to potential, while the total amount of energy remains constant, within a system
✓ Analyze the velocity of two objects in terms of distance and time
✓ Identify forces acting on a falling object and how those forces affect the rate of acceleration
✓ Analyze and determine the effect of the sum of the forces acting on an object using a force diagram
✓ Measure and analyze graphically an object’s motion in terms of speed, velocity, and acceleration
✓ Determine the effect on acceleration using information about net force and mass
✓ Describe and analyze the relationships among force, distance, and work
Basic

In addition to understanding and applying the skills at the Below Basic level, students at this level:

✓ Identify pure substances by their physical properties
✓ Distinguish between physical and chemical changes in matter
✓ Identify acidic and basic solutions based on the pH scale
✓ Predict the effect of a temperature change on the properties of a material
✓ Describe the atom as having a dense, positive nucleus surrounded by a cloud of negative electrons
✓ Describe the information provided by the atomic number and the mass number
✓ Explain the relationship between kinetic energy and temperature
✓ Differentiate between the properties and examples of conductors and insulators
✓ Describe sources and common uses of different forms of energy
✓ Identify advantages/disadvantages of using various sources of energy for human activity
✓ Identify stars as producers of electromagnetic energy
✓ Classify examples of heat transfer as convection, conduction, or radiation
✓ Distinguish between examples of kinetic and potential energy within a system
✓ Describe the effect of work on an object’s potential energy
✓ Measure and analyze an object’s motion in terms of speed and velocity
✓ Describe the relationship between applied net force and the distance an object moves
✓ Compare and describe the gravitational forces between two objects in terms of the distances between them
✓ Recognize the difference between weight and mass
✓ Identify and describe balanced and unbalanced forces acting on an object
✓ Recognize all free falling bodies accelerate at the same rate due to gravity regardless of their mass
✓ Recognize that inertia is a property of matter that can be described as an object’s tendency to resist a change in motion

Below Basic

Students at this level:

✓ Classify a substance as being made up of one kind of atom when given the structural formula for the substance
✓ Compare the common properties of metals and nonmetals
✓ Using the Kinetic Theory model, explain the particle motion during phase changes
✓ Describe the information provided by the atomic number
✓ Classify elements as metals and nonmetals according to their location on the Periodic Table
✓ Differentiate between examples of conductors and insulators
✓ Classify examples of heat transfer as conduction or radiation
✓ Describe an object’s motion in terms of speed and velocity
✓ Describe gravity as an attractive force among all objects
✓ Compare the gravitational forces between two objects in terms of the distances between them
✓ Identify forces acting on an object