

# Course: 2003010 M/J Physical Science

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## BASIC INFORMATION

<b>Course Number:</b>	2003010
<b>Course Title:</b>	M/J Physical Science
<b>Course Abbreviated Title:</b>	M/J PHY SCI
<b>Course Path:</b>	<b>Section:</b> Grades PreK to 12 Education Courses » <b>Grade Group:</b> Grades 6 to 8 Education Courses » <b>Subject:</b> Science » <b>SubSubject:</b> Physical Sciences »
<b>Course Length:</b>	Year
<b>Status:</b>	State Board Approved

## STANDARDS (62)

<b><u>LA.6.2.2.3:</u></b>	The student will organize information to show understanding (e.g., representing main ideas within text through charting, mapping, paraphrasing, summarizing, or comparing/contrasting);
<b><u>LA.6.4.2.2:</u></b>	The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information and include a list of sources used;
<b><u>MA.6.A.3.6:</u></b>	Construct and analyze tables, graphs, and equations to describe linear functions and other simple relations using both common language and algebraic notation.

<p><b><u>MA.6.S.6.2:</u></b></p>	<p>Select and analyze the measures of central tendency or variability to represent, describe, analyze, and/or summarize a data set for the purposes of answering questions appropriately.</p>
<p><b><u>SC.6.N.1.1:</u></b></p>	<p>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</p>
<p><b><u>SC.6.N.1.2:</u></b></p>	<p>Explain why scientific investigations should be replicable.</p>
<p><b><u>SC.6.N.1.3:</u></b></p>	<p>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</p>
<p><b><u>SC.6.N.1.4:</u></b></p>	<p>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</p>
<p><b><u>SC.6.N.1.5:</u></b></p>	<p>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</p>
<p><b><u>SC.6.N.2.1:</u></b></p>	<p>Distinguish science from other activities involving thought.</p>

<b><u>SC.6.N.2.2:</u></b>	Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.
<b><u>SC.6.N.2.3:</u></b>	Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.
<b><u>SC.6.N.3.1:</u></b>	Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.
<b><u>SC.6.N.3.2:</u></b>	Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.
<b><u>SC.6.N.3.3:</u></b>	Give several examples of scientific laws.
<b><u>SC.6.N.3.4:</u></b>	Identify the role of models in the context of the sixth grade science benchmarks.
<b><u>SC.6.P.11.1:</u></b>	Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.
<b><u>SC.6.P.12.1:</u></b>	Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.

<b><u>SC.6.P.13.1:</u></b>	Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.
<b><u>SC.6.P.13.2:</u></b>	Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.
<b><u>SC.6.P.13.3:</u></b>	Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.
<b><u>SC.7.N.1.1:</u></b>	Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
<b><u>SC.7.N.1.2:</u></b>	Differentiate replication (by others) from repetition (multiple trials).
<b><u>SC.7.N.1.3:</u></b>	Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.
<b><u>SC.7.N.1.4:</u></b>	Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

<b><u>SC.7.N.1.5:</u></b>	Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.
<b><u>SC.7.N.1.6:</u></b>	Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.
<b><u>SC.7.N.1.7:</u></b>	Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.
<b><u>SC.7.N.2.1:</u></b>	Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.
<b><u>SC.7.N.3.1:</u></b>	Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
<b><u>SC.7.N.3.2:</u></b>	Identify the benefits and limitations of the use of scientific models.
<b><u>SC.7.P.10.1:</u></b>	Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.
<b><u>SC.7.P.10.2:</u></b>	Observe and explain that light can be reflected, refracted, and/or absorbed.

<b><u>SC.7.P.10.3:</u></b>	Recognize that light waves, sound waves, and other waves move at different speeds in different materials.
<b><u>SC.7.P.11.1:</u></b>	Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.
<b><u>SC.7.P.11.2:</u></b>	Investigate and describe the transformation of energy from one form to another.
<b><u>SC.7.P.11.3:</u></b>	Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.
<b><u>SC.7.P.11.4:</u></b>	Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.
<b><u>SC.8.N.1.1:</u></b>	Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
<b><u>SC.8.N.1.2:</u></b>	Design and conduct a study using repeated trials and replication.
<b><u>SC.8.N.1.3:</u></b>	Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.

<b><u>SC.8.N.1.4:</u></b>	Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.
<b><u>SC.8.N.1.5:</u></b>	Analyze the methods used to develop a scientific explanation as seen in different fields of science.
<b><u>SC.8.N.1.6:</u></b>	Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.
<b><u>SC.8.N.2.1:</u></b>	Distinguish between scientific and pseudoscientific ideas.
<b><u>SC.8.N.2.2:</u></b>	Discuss what characterizes science and its methods.
<b><u>SC.8.N.3.1:</u></b>	Select models useful in relating the results of their own investigations.
<b><u>SC.8.N.3.2:</u></b>	Explain why theories may be modified but are rarely discarded.
<b><u>SC.8.N.4.1:</u></b>	Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.
<b><u>SC.8.N.4.2:</u></b>	Explain how political, social, and economic concerns can affect science, and vice versa.

<b><u>SC.8.P.8.1:</u></b>	Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.
<b><u>SC.8.P.8.2:</u></b>	Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.
<b><u>SC.8.P.8.3:</u></b>	Explore and describe the densities of various materials through measurement of their masses and volumes.
<b><u>SC.8.P.8.4:</u></b>	Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.
<b><u>SC.8.P.8.5:</u></b>	Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
<b><u>SC.8.P.8.6:</u></b>	Recognize that elements are grouped in the periodic table according to similarities of their properties.
<b><u>SC.8.P.8.7:</u></b>	Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).

<b><u>SC.8.P.8.8:</u></b>	Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.
<b><u>SC.8.P.8.9:</u></b>	Distinguish among mixtures (including solutions) and pure substances.
<b><u>SC.8.P.9.1:</u></b>	Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.
<b><u>SC.8.P.9.2:</u></b>	Differentiate between physical changes and chemical changes.
<b><u>SC.8.P.9.3:</u></b>	Investigate and describe how temperature influences chemical changes.

## RELATED GLOSSARY TERM DEFINITIONS (64)

<b>Central tendency:</b>	A measure used to describe data (e.g., mean, mode, median).
<b>Equation:</b>	A mathematical sentence stating that the two expressions have the same value. Also read the definition of equality.
<b>Line:</b>	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
<b>Linear function:</b>	A relationship between two variables such that for a fixed change in one variable, there is fixed change in the other variable. If there is one independent variable (e.g. $f(x)=mx+b$ ), then the graph of the function will be a line. If there are two independent variables (e.g. $f(x,y)=ax+by+c$ ) then the graph of the function will be a plane.

<b>Mean:</b>	<p>There are several statistical quantities called means, e.g., harmonic mean, arithmetic mean, and geometric mean. However, “mean” commonly refers to the arithmetic mean that is also called arithmetic average. Arithmetic mean is a mathematical representation of the typical value of a series of numbers, computed as the sum of all the numbers in the series divided by the count of all numbers in the series.</p> <p>Arithmetic mean is the balance point if the numbers are considered as weights on a beam.</p>
<b>Median:</b>	<p>When the numbers are arranged from least to greatest, the middle number of a set of numbers, or the mean of two middle numbers when the set has two middle numbers is called median. Half of the numbers are above the median and half are below it.</p>
<b>Mode:</b>	<p>The most frequent value(s) of a set of data. A data set may have more than one mode if two or more data values appear the most. When no data value occurs more than once in a data set, there is no mode.</p>
<b>Outlier:</b>	<p>An outlier is a data point that lies outside the overall pattern of a distribution. An outlier is usually a point which falls more than 1.5 times the interquartile range above the third quartile or below the first quartile. Outliers can also be identified on a scatter plot.</p>
<b>Relation:</b>	<p>A relation from A to B is any subset of the cross product (Cartesian product) of A and B.</p>
<b>Set:</b>	<p>A set is a finite or infinite collection of distinct objects in which order has no significance.</p>
<b>Table:</b>	<p>A data display that organizes information about a topic into categories using rows and columns.</p>

<b>Acid:</b>	A substance that increases the H <sup>+</sup> concentration when added to a water solution Acids turn blue litmus paper red, have a pH of less than 7, and their aqueous solutions react with bases and certain metals to form salts.
<b>Atom:</b>	The smallest unit of a chemical element that can still retain the properties of that element.
<b>Base:</b>	A substance that increases the OH <sup>-</sup> concentration of a solution; a proton acceptor.
<b>Boil:</b>	To change from a liquid to a vapor by the application of heat.
<b>Chemical change:</b>	A reaction or a change in a substance produced by chemical means that results in producing a different chemical.
<b>Compound:</b>	A substance made up of at least two different elements held together by chemical bonds that can only be broken down into elements by chemical processes.
<b>Conductivity:</b>	The ability or power to conduct or transmit heat, electricity, or sound.
<b>Conservation of Mass:</b>	The principle that mass cannot be created or destroyed; also conservation of matter.
<b>Density:</b>	Concentration of matter of an object; number of individuals in the same species that live in a given area; the mass per unit volume.
<b>Dependent variable:</b>	Factor being measured or observed in an experiment.
<b>Electron:</b>	A stable elementary particle in the lepton family having a mass at rest of $9.107 \times 10^{-28}$ grams and an electric charge of approximately $-1.602 \times 10^{-19}$ coulombs. Electrons orbit about the positively charged nuclei of atoms in distinct orbitals of different energy levels, called shells.
<b>Energy:</b>	The capacity to do work.

<b>Experiment:</b>	A procedure that is carried out and repeated under controlled conditions in order to discover, demonstrate, or test a hypothesis.
<b>Force:</b>	A vector quantity that exists between two objects and, when unbalanced by another force, causes changes in velocity of objects in the direction of its application; a push or pull.
<b>Gas:</b>	One of the fundamental states of matter in which the molecules do not have a fixed volume or shape.
<b>Gravity:</b>	The force of attraction between any two objects.
<b>Heat:</b>	Energy that transfers between substances because of a temperature difference between the substances; the transfer of energy is always from the warmer substance to the cooler substance
<b>Hypothesis :</b>	A tentative explanation for an observation, phenomenon, or scientific problem that can be tested by further investigation.
<b>Independent variable:</b>	The factor that is changed in an experiment in order to study changes in the dependent variable.
<b>Infrared :</b>	Relating to the invisible part of the electromagnetic spectrum with wavelengths longer than those of visible red light but shorter than those of microwaves.
<b>Investigation :</b>	A systematic process that uses various types of data and logic and reasoning to better understand something or answer a question.
<b>Kinetic energy:</b>	The energy possessed by a body because of its motion.
<b>Law :</b>	A statement that describes invariable relationships among phenomena under a specified set of conditions.

<b>Light:</b>	Electromagnetic radiation that lies within the visible range.
<b>Liquid:</b>	One of the fundamental states of matter with a definite volume but no definite shape.
<b>Magnetic:</b>	Having the property of attracting iron and certain other materials by virtue of a field of force.
<b>Mass:</b>	The amount of matter an object contains.
<b>Melt:</b>	To be changed from a solid to a liquid state especially by the application of heat.
<b>Model :</b>	A systematic description of an object or phenomenon that shares important characteristics with the object or phenomenon. Scientific models can be material, visual, mathematical, or computational and are often used in the construction of scientific theories.
<b>Motion:</b>	The act or process of changing position and/or direction.
<b>Neutron:</b>	A subatomic particle having zero charge, found in the nucleus of an atom.
<b>Nucleus:</b>	The center region of an atom where protons and neutrons are located; also a cell structure that contains the cell genetic material of the cell.
<b>Observation :</b>	What one has observed using senses or instruments.
<b>Periodic table:</b>	A tabular arrangement of the elements according to their atomic numbers so that elements with similar properties are in the same column.
<b>Physical change :</b>	A reaction; a change in matter from one form to another, without forming new substances.
<b>Potential energy:</b>	Energy stored in a physical system due to the object's configuration and position.

<b>Proton:</b>	A subatomic particle having a positive charge and which is found in the nucleus of an atom.
<b>Pseudoscientific:</b>	A theory, methodology, or practice that is considered to be without scientific foundation.
<b>Radiation:</b>	Emission of energy in the form of rays or waves.
<b>Replication:</b>	In scientific research, conducting an experiment to confirm findings or to ensure accuracy. In molecular biology, the process by which genetic material is copied in cells.
<b>Scientist:</b>	A person with expert knowledge of one or more sciences, that engages in processes to acquire and communicate knowledge.
<b>Sense:</b>	Any of the faculties by which stimuli from outside or inside the body are received and felt, as the faculties of hearing, sight, smell, touch, taste, and equilibrium.
<b>Solid:</b>	Having a definite shape and a definite volume; one of the fundamental states of matter.
<b>Solubility:</b>	The ability or tendency of one substance to dissolve in another at a given temperature and pressure.
<b>Sound wave:</b>	Longitudinal pressure waves in any material medium regardless of whether they constitute audible sound; earthquake waves and ultrasonic waves are sometimes called sound waves.
<b>Speed:</b>	Amount of distance traveled divided by time taken; the time-rate at which any physical process takes place.
<b>Sun:</b>	The closest star to Earth and the center of our solar system.

<b>Theory :</b>	A set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena.
<b>Ultraviolet :</b>	Relating to electromagnetic radiation having frequencies higher than those of visible light but lower than those of x-rays, approximately 10 <sup>15</sup> -10 <sup>16</sup> hertz.
<b>Variable:</b>	An event, condition, or factor that can be changed or controlled in order to study or test a hypothesis in a scientific experiment.
<b>Volume:</b>	A measure of the amount of space an object takes up; also the loudness of a sound or signal.
<b>Wavelength:</b>	The distance between crests of a wave.
<b>Weight:</b>	The force with which a body is attracted to Earth or another celestial body, equal to the product of the object's mass and the acceleration of gravity.



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