

# **Riverside Science Literacy Standards and Benchmarks –**

## **Standard 1: Understands Unifying Concepts and Processes:**

**Provide students with ways of thinking about the integrating a range of basic ideas, which help them to understand the natural world.**

## **Standard 2: Science as Inquiry:**

**Understands how to combine processes and scientific knowledge with scientific reasoning and critical thinking.**

## **Standard 3: Physical Science:**

**Understands physical science facts, concepts, principles, theories and models that are important for all students.**

## **Standard 4: Life Science:**

**Understands life science facts, concepts, principles, theories and models that are important for all students.**

## **Standard 5: Earth and Space Science:**

**Understands earth and space science facts, concepts, principles, theories and models that are important for all students.**

## **Standard 6: Science and Technology:**

**Establishes connections between the natural and designed worlds and provide students with opportunities to develop decision-making abilities.**

## **Standard 7: Science in Personal and Social Perspectives:**

**Understands the importance of the sciences impacting personal and social issues.**

## **Standard 8: History and Nature of Science:**

**Understanding science as a human endeavor and the role it has played in civilization and the development of various cultures.**

	<b>Standard 1</b>  <b>Unifying Concepts and Processes</b> Provide students with ways of thinking about the integrating a range of basic ideas, which help them to understand the natural world.	<b>Standard 2</b>  <b>Science as Inquiry</b> Understands how to combine processes and scientific knowledge with scientific reasoning and critical thinking.	<b>Standard 3</b>  <b>Physical Science</b> Understands physical science facts, concepts, principles, theories and models that are important for all students.	<b>Standard 4</b>  <b>Life Science</b> Understands life science facts, concepts, principles, theories and models that are important for all students.	<b>Standard 5</b>  <b>Earth and Space Science</b> <b>Understands earth and space science facts, concepts, principles, theories and models that are important for all students.</b>	<b>Standard 6</b>  <b>Science and Technology</b> <b>Establishes connections between the natural and designed worlds and provide students with opportunities to develop decision-making abilities.</b>	<b>Standard 7</b>  <b>Science in Personal and Social Perspectives</b> <b>Science in Personal and Social Perspectives: Understands the importance of the sciences impacting personal and social issues.</b>	<b>Standard 8</b>  <b>History and Nature of Science</b> <b>Understanding science as a human endeavor and the role it has played in civilization and the development of various cultures.</b>
<b>9<sup>th</sup> Grade Physical Science</b>	1.1 Understands the following terms used to describe various types of scientific explanations: hypothesis, model, law, principle, theory, and paradigm.	2.1 Demonstrates the abilities necessary to do scientific inquiry. a. Identify questions and concepts that guide scientific investigations. b. Formulate testable hypothesis. c. Design and conduct scientific investigations. d. Use technology and mathematics to improve investigations and communications. e. Formulate and revise scientific explanations and models using logic and evidence. f. Recognize and analyze alternative explanations and models. (GF) g. Communicate and defend a scientific argument. (G)	3.1 Understands the periodic table in terms of repeating patterns of properties and the impact the properties have on the way the elements react with one another. a. Know the names and symbols for <u>common</u> elements. b. Repeating patterns include mass, number of electrons in outer orbital and reactivity. c. Elements of common properties are grouped together in families. d. Reactions occur due to sharing or transferring electrons in the outer orbital. e. Reactions will either release or consume energy.			6.1 Knows how to design a solution, implement a proposed design, evaluate, and communicate the process of technological design. (C)		8.1 Understands that societal, cultural, and personal beliefs and ways of viewing the world influence scientists. Science is not separate from society but rather science is a part of society. (G, MC, GF)
			3.2 Understands the structures of atoms. a. Atoms are composed of a nucleus made of protons and neutrons surrounded by electrons. b. Electrons are negatively					8.2 Understands that all scientific knowledge is subject to change, as new evidence becomes available. (C)

			<p>charged, protons are positive, and neutrons are neutrally charged.</p> <p>c. Isotopes differ in numbers of neutrons.</p>					
			<p>3.3 Understands the effect of forces on the motion of objects.</p> <p>a. Inertia is the tendency of an object to resist any change in motion; if motionless, it remains still; if moving, it keeps moving.</p> <p>b. Increasing an unbalanced force on an object increases the change in motion of the object. (<math>F = ma</math>)</p> <p>c. Knows that whenever something exerts a force on another object and equal amount of force is exerted back on it.</p>					<p>8.3 Understands the historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time, almost always building on earlier knowledge.</p> <p><b>(MC, G, GF)</b></p>
			<p>3.4 Understands the law of conservation of matter and energy.</p> <p>a. When matter in a closed system interacts, the total mass of the system remains the same.</p> <p>b. Understands that some chemical reactions require an input of energy, while others cause energy to be released.</p> <p>c. The evidence of chemical reactions may involve a temperature change that is</p>					

			counterintuitive.					
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<b>11<sup>th</sup> &amp; 12<sup>th</sup> Grades Chemistry</b>	1.1 Understands that changes within a system can be measured and that mathematics is essential in the process of measurement.	2.1 Demonstrates the abilities necessary to do scientific inquiry. a. Identify questions and concepts that guide scientific investigations. b. Formulate testable hypothesis. c. Design and conduct scientific investigations. d. Use technology and mathematics to improve investigations and communications. e. Formulate and revise scientific explanations and models using logic and evidence. f. Recognize and analyze alternative explanations and models. g. Communicate and defend a scientific argument.	3.1 Understands the structure and properties of matter. a. Atoms interact with one another by transferring or sharing electrons in the outer orbitals. b. Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together. c. Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures.	4.1 Understands that the earth is a system containing essentially a fixed amount of each stable chemical atom or element. Each element can exist in several different chemical reservoirs. Each element on earth moves among reservoirs in the solid earth, oceans, atmospheres, and organisms as part of geochemical cycles. (Carbon and Nitrogen)		6.1 Knows how to design a solution, implement a proposed design, evaluate, and communicate the process of technological design. (C)	7.1 Understands that the earth does not have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources and it depletes those resources that cannot be renewed. (G)	8.1 Understands that societal, cultural, and personal beliefs and ways of viewing the world influence scientists. Science is not separate from society but rather science is a part of society. (MC, GF)
			3.2 Understands chemical reactions. a. Chemical reactions may release or consume energy. b. A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions). In other reactions, chemical bonds are broken by heat or light to form very reactive radicals with electrons ready to form new bonds.	4.2 Understands that the movement of matter between reservoirs is driven by the earth's internal and external sources of energy. These movements are often accompanied by a change in the physical and chemical properties of the matter.			7.2 Understands that natural ecosystems provide an array of basic processes that affect humans. Those processes include maintenance of the quality of the atmosphere, generation of soils, disposal of wastes, and recycling of nutrients. Humans are changing many of these basic processes which may be detrimental to humans. (G)	8.2 Understands that all scientific knowledge is subject to change, as new evidence becomes available. (MC, GF)

			<p>c. Chemical reactions take place in varying time periods. These reaction rates depend on how often the reacting atoms and molecules encounter one another, on the temperature, and on the properties – including shape – of the reacting species.</p> <p>d. Catalysts accelerate chemical reactions.</p>					
			<p>3.3 Understands the meaning of conservation of energy and the increase in disorder.</p> <p>a. The total energy of the universe is constant. Energy can be transferred, but never destroyed.</p> <p>b. All energy can be considered to be either kinetic energy, which is the energy of motion; potential energy, which depends on relative position; or energy contained by a field, such as electromagnetic waves.</p> <p>c. Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.</p> <p>d. Everything tends to become less</p>				<p>7.3 Understands that the materials from human societies affect both physical and chemical cycles of the earth. (G)</p>	<p>8.3 Understands that the historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time, almost always building on earlier knowledge. (MC, GF)</p>

			organized and less orderly over time. Thus, in all energy transfers, the overall effect is that the energy is spread out uniformly (conduction, radiation, and convection).					
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# 12<sup>th</sup> Grade Advanced Chemistry

<p>1.1 Understands the following terms used to describe various types of scientific explanations: hypothesis, model, law, principle, theory, and paradigm.</p>	<p>2.1 Demonstrates the abilities necessary to do scientific inquiry.</p> <ol style="list-style-type: none"> <li>Identify questions and concepts that guide scientific investigations.</li> <li>Formulate testable hypothesis.</li> <li>Design and conduct scientific investigations.</li> <li>Use technology and mathematics to improve investigations and communications.</li> <li>Formulate and revise scientific explanations and models using logic and evidence.</li> <li>Recognize and analyze alternative explanations and models.</li> <li>Communicate and defend a scientific argument.</li> </ol>	<p>3.1 Understands nuclear reactions.</p> <ol style="list-style-type: none"> <li>Nuclear reactions convert a fraction of the mass of interacting particles into energy.</li> <li>Nuclear reactions release much greater amounts of energy than atomic interactions.</li> <li>Fission is the splitting of a large nucleus into smaller pieces.</li> <li>Fusion is the joining of two nuclei at extremely high temperature and pressure, and is the process responsible for the energy of the sun and other stars.</li> <li>Radioactive isotopes are unstable and undergo spontaneous nuclear reactions emitting particles and/or wavelike radiation.</li> <li>The decay of any one nucleus cannot be predicted, but a large group of identical nuclei decay at a predictable rate. This predictability can be used to estimate the age of materials that contain radioactive isotopes.</li> </ol>	<p>4.1 Understands basic biochemistry principles.</p> <ol style="list-style-type: none"> <li>Food molecules taken into cells react to provide the chemical constituents needed to synthesize other molecules.</li> <li>The breakdown of some of the food molecules enables the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.</li> <li>The energy for life primarily derives from the sun.</li> <li>The chemical structure of molecules found in the body, such as proteins, carbohydrates, fats, amino acids and ATP effect the functions of these molecules.</li> </ol>		<p>6.1 Knows how to design a solution, implement a proposed design, evaluate, and communicate the process of technological design. (C)</p>	<p>7.1 Understands how the food, he or she eats is used within the cells of the body.</p>	<p>8.1 Understands that societal, cultural, and personal beliefs and ways of viewing the world influence scientists. Science is not separate from society but rather science is a part of society. (G, MC, GF)</p>
		<p>3.2 Understands basic organic chemistry principles.</p> <ol style="list-style-type: none"> <li>Carbon atoms can bond to one another in chains, rings, and</li> </ol>				<p>7.2 Knows why nuclear weapons are a threat and will discover ways to dispose of nuclear waste.</p>	<p>8.2 Understand that all scientific knowledge is subject to change, as new evidence becomes available. (C)</p>

			branching networks. b. Atoms containing carbon and hydrogen atoms are considered organic molecules. c. Organic molecules form a variety of structures which include the following: synthetic polymers, oil, and the large molecules essential for life.					
								8.3 Understands the historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time, almost always building on earlier knowledge. (G, MC, GF)