Publisher:	Glencoe/McGraw-Hill
Program Title:	**© 2002 Glencoe Physical Science**
Components:	Student Edition (SE) and Teacher Wraparound Edition (TWE)
Grade Level(s):	High School

Intended Audience: Science students in high school (Refer to the appropriate science standards throughout document and beginning on page 35) **Discipline: Investigation and Experimentation**

Standards Map - Basic Comprehensive Program
Grades Nine Through Twelve - Science

Pursuant to the State Board approved, *Science Content Standards for California Public Schools, Kindergarten Through Grade Twelve*
Standards that all students are expected to achieve in the course of their studies are unmarked.
Standards that all students should have the opportunity to learn are marked with an asterisk (*).

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
DISCIPLINE		**PHYSICS**						
		Motion and Forces Newton's laws predict the motion of most objects. As a basis for understanding this concept:						
9-12	1a	Students know how to solve problems that involve constant speed and average speed.	SE/TWE: 38, 39, 40, 41, 42, 43, 62	SE/TWE: 40, 46, 64, 65	SE/TWE: 64, 65			
9-12	1b	Students know that when forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest (Newton's first law).	SE/TWE: 38, 54, 55, 56, 62	SE/TWE: 55, 56, 63, 64	SE/TWE: 64, 65			
9-12	1c	Students know how to apply the law *F* = *ma* to solve one-dimensional motion problems that involve constant forces (Newton's second law).	SE/TWE: 68, 69-74, 94	SE/TWE: 68, 74, 95 TWE: 69	SE/TWE: 74, 96, 97			
9-12	1d	Students know that when one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction (Newton's third law).	SE/TWE: 83-88, 90-91, 94	SE/TWE: 88, 95, 96 TWE: 84	SE/TWE: 96, 97			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	1e	Students know the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of Earth.	SE/TWE: 75-82, 94	SE/TWE: 77, 78, 81, 82, 95	SE/TWE: 82, 96, 97			
9-12	1f	Students know applying a force to an object perpendicular to the direction of its motion causes the object to change direction but not speed (e.g., Earth's gravitational force causes a satellite in a circular orbit to change direction but not speed).	SE/TWE: 76-77, 94	SE/TWE: 82, 96	SE/TWE: 82, 96, 97			
9-12	1g	Students know circular motion requires the application of a constant force directed toward the center of the circle.	SE/TWE: 81-82	SE/TWE: 82, 96	SE/TWE: 82, 96, 97			
9-12	1h*	Students know Newton's laws are not exact but provide very good approximations unless an object is moving close to the speed of light or is small enough that quantum effects are important.	SE/TWE: 68, 83, 92-93, 94	SE/TWE: 93				
9-12	1i*	Students know how to solve two-dimensional trajectory problems.	SE/TWE: 36-44, 47-51, 62, 66-67, 68-74, 75-82, 83-88, 94	SE/TWE: 42, 51, 64, 74, 82, 89, 90-91, 97	SE/TWE: 89, 90-91, 97			
9-12	1j*	Students know how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.	SE/TWE: 68-74, 83-88	SE/TWE: 74, 88	SE/TWE: 90-91, 97			
	1k*	Students know how to solve two-dimensional problems involving balanced forces (statics).	SE/TWE: 52, 53, 830	SE/TWE: 56, 64 TWE: 53	SE/TWE: 56			
9-12	1l*	Students know how to solve problems in circular motion by using the formula for centripetal acceleration in the following form: $a = v^2 / r$.	SE/TWE: 81-82, 95	SE/TWE: 81				
9-12	1m*	Students know how to solve problems involving the forces between two electric charges at a distance (Coulomb's law) or the forces between two masses at a distance (universal gravitation).						

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
		Conservation of Energy and Momentum The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects. As a basis for understanding this concept:						
9-12	2a	Students know how to calculate kinetic energy by using the formula $E = (1/2)mv^2$.	SE/TWE: 102, 106, 108-110, 120, 121	SE/TWE: 105, 106, 123 TWE: 110	SE/TWE: 105, 106, 123 TWE: 110			
9-12	2b	Students know how to calculate changes in gravitational potential energy near Earth by using the formula (change in potential energy) = *mgh* (*h* is the change in the elevation).	SE/TWE: 104-105, 106, 109	SE/TWE: 104, 105, 106	SE/TWE: 104, 105, 106			
9-12	2c	Students know how to solve problems involving conservation of energy in simple systems, such as falling objects.	SE/TWE: 110-114, 116-117, 135	SE/TWE: 115, 116-117 TWE: 110	SE/TWE: 115, 117 TWE: 110			
9-12	2d	Students know how to calculate momentum as the product *mv*.	SE/TWE: 86-91, 94	SE/TWE: 88, 89	SE/TWE: 89, 91			
9-12	2e	Students know momentum is a separately conserved quantity different from energy.	SE/TWE: 86-88, 94	SE/TWE: 88	SE/TWE: 88			
9-12	2f	Students know an unbalanced force on an object produces a change in its momentum.	SE/TWE: 56, 68, 69, 86	SE/TWE: 57, 69	SE/TWE: 57, 69			
9-12	2g	Students know how to solve problems involving elastic and inelastic collisions in one dimension by using the principles of conservation of momentum and energy.	SE/TWE: 86-88, 103, 110-114,	SE/TWE: 88, 89, 90-91	SE/TWE: 89, 91			
9-12	2h*	Students know how to solve problems involving conservation of energy in simple systems with various sources of potential energy, such as capacitors and springs.	SE/TWE: 108-109, 110-114, 120	SE/TWE: 115 TWE: 110	SE/TWE: 115 TWE: 110			
		Heat and Thermodynamics Energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat. As a basis for understanding this concept:						

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	3a	Students know heat flow and work are two forms of energy transfer between systems.	SE/TWE: 101, 107-114, 161, 174, 175, 184, 393	SE/TWE: 115, 163, 175, 179	SE/TWE: 115, 175, 179			
9-12	3b	Students know that the work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature (first law of thermodynamics) and that this is an example of the law of conservation of energy.	SE/TWE: 158, 176-177, 184, 185	SE/TWE: 179, 185, 186	SE/TWE: 179, 185			
9-12	3c	Students know the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy. The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object.	SE/TWE: 158-163, 184	SE/TWE: 162, 163 TWE: 159, 160, 161	SE/TWE: 163, TWE: 161			
9-12	3d	Students know that most processes tend to decrease the order of a system over time and that energy levels are eventually distributed uniformly.	SE/TWE: 98-99, 100-105, 107-115, 120	SE/TWE: 99, 105, 106, 115, 116-117, 121, 122-123	SE/TWE: 99, 105, 106, 115, 117, 121, 123			
9-12	3e	Students know that entropy is a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.						
9-12	3f*	Students know the statement "Entropy tends to increase" is a law of statistical probability that governs all closed systems (second law of thermodynamics).						
9-12	3g*	Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.	SE/TWE: 124-125, 126-131, 132-137, 138-146, 152	SE/TWE: 125, 131, 137, 146, 147, 148-149, 153, 154-155	SE/TWE: 125, 131, 137, 146, 117, 149, 155			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
		Waves Waves have characteristic properties that do not depend on the type of wave. As a basis for understanding this concept:						
9-12	4a	Students know waves carry energy from one place to another.	SE/TWE: 326-331, 352	SE/TWE: 331, 354 TWE: 328, 330	SE/TWE: 331, 354			
9-12	4b	Students know how to identify transverse and longitudinal waves in mechanical media, such as springs and ropes, and on the earth (seismic waves).	SE/TWE: 327-331, 352	SE/TWE: 331	SE/TWE: 331			
9-12	4c	Students know how to solve problems involving wavelength, frequency, and wave speed.	SE/TWE: 332-337, 352	SE/TWE: 333, 335, 337, 338, 348-349, 354	SE/TWE: 335, 337, 338, 349, 355			
9-12	4d	Students know sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.	SE/TWE: 328, 358-360	SE/TWE: 362 TWE: 328	SE/TWE: 362			
9-12	4e	Students know radio waves, light, and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in a vacuum is approximately 3x108 m/s (186,000 miles/second).	SE/TWE: 396-401, 403-405	SE/TWE: 397, 401 TWE: 399, 404, 405	SE/TWE: 397, 401 TWE: 399, 404, 405			
9-12	4f	Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.	SE/TWE: 332-337, 339-347	SE/TWE: 332, 335, 337, 338, 347, 348-349	SE/TWE: 335, 337, 338, 347, 349			
		Electric and Magnetic Phenomena Electric and magnetic phenomena are related and have many practical applications. As a basis for understanding this concept:						
9-12	5a	Students know how to predict the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors, and capacitors.	SE/TWE: 202-207, 244	SE/TWE: 207	SE/TWE: 207			
9-12	5b	Students know how to solve problems involving Ohm's law.	SE/TWE: 207, 220	SE/TWE: 207	SE/TWE: 207			

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	5c	Students know any resistive element in a DC circuit dissipates energy, which heats the resistor. Students can calculate the power (rate of energy dissipation) in any resistive circuit element by using the formula Power = IR (potential difference) x I (current) = I^2R.	SE/TWE: 206-207, 213	SE/TWE: 207, 213	SE/TWE: 207, 213			
9-12	5d	Students know the properties of transistors and the role of transistors in electric circuits.	SE/TWE: 202 TWE: 196	TWE: 196				
9-12	5e	Students know charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.	SE/TWE: 196, 391-392	SE/TWE: 395	SE/TWE: 395			
9-12	5f	Students know magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.	SE/TWE: 391-392	SE/TWE: 395	SE/TWE: 395			
9-12	5h	Students know how to determine the direction of a magnetic field produced by a current flowing in a straight wire or in a coil.	SE/TWE: 233-239	SE/TWE: 239 TWE: 237	SE/TWE: 239			
9-12	5h	Students know changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.	SE/TWE: 240-246, 252	SE/TWE: 246, 247, 248-249	SE/TWE: 246, 247, 249			
9-12	5i	Students know plasmas, the fourth state of matter, contain ions or free electrons or both and conduct electricity.	SE/TWE: 492, 513	SE/TWE: 513 TWE: 492	SE/TWE: 513 TWE: 492			
9-12	5j*	Students know electric and magnetic fields contain energy and act as vector force fields.	SE/TWE: 196, 391					
9-12	5k*	Students know the force on a charged particle in an electric field is qE, where E is the electric field at the position of the particle and q is the charge of the particle.						
9-12	5l*	Students know how to calculate the electric field resulting from a point charge.						
9-12	5m*	Students know static electric fields have as their source some arrangement of electric charges.	SE/TWE: 194-200, 220	SE/TWE: 198, 200, 201, 221	SE/TWE: 198, 201, 221			

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	5n*	Students know the magnitude of the force on a moving particle (with charge q) in a magnetic field is qvB sin(a), where a is the angle between v and B (v and B are the magnitudes of vectors v and B, respectively), and students use the right-hand rule to find the direction of this force.						
9-12	5o*	Students know how to apply the concepts of electrical and gravitational potential energy to solve problems involving conservation of energy.	SE/TWE: 104-105, 106, 107	SE/TWE: 104, 105, 106	SE/TWE: 105, 106			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
DISCIPLINE		**CHEMISTRY**						
		Atomic and Molecular Structure The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept:						
9-12	1a	Students know how to relate the position of an element in the periodic table to its atomic number and atomic mass.	SE/TWE: 556-557, 558-561, 568, 828-829	SE/TWE: 562, 570	SE/TWE: 562, 570, 571			
9-12	1b	Students know how to use the periodic table to identify metals, semimetals, non-metals, and halogens.	SE/TWE: 556-557, 558-561, 568, 828-829	SE/TWE: 562, 570	SE/TWE: 562, 570			
9-12	1c	Students know how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms.	SE/TWE: 556-557, 558-561, 610-615, 828-829	SE/TWE: 562, 615	SE/TWE: 562, 615			
9-12	1d	Students know how to use the periodic table to determine the number of electrons available for bonding.	SE/TWE: 556-557, 559-560, 828-829	SE/TWE: 560, 570	SE/TWE: 570			
9-12	1e	Students know the nucleus of the atom is much smaller than the atom yet contains most of its mass.	SE/TWE: 550, 558	TWE: 550	TWE: 550			
9-12	1f*	Students know how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators.	SE/TWE: 556-557, 614, 828-829	SE/TWE: 614	SE/TWE: 614			
9-12	1g*	Students know how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table.	SE/TWE: 556-562, 828-829	SE/TWE: 561, 562	SE/TWE: 561, 562			

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	1h*	Students know the experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect.						
9-12	1i*	Students know the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom.						
9-12	1j*	Students know that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship ($E = hv$).						
		Chemical Bonds Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules. As a basis for understanding this concept:						
9-12	2a	Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.	SE/TWE: 577-578, 580-585, 598	SE/TWE: 581, 586, 599	SE/TWE: 586			
9-12	2b	Students know chemical bonds between atoms in molecules such as H_2, CH_4, NH_3, H_2CCH_2, N_2, Cl_2 , and many large biological molecules are covalent.	SE/TWE: 580, 583, 598	SE/TWE: 586, 599, 600	SE/TWE: 586, 600, 601			
9-12	2c	Students know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.	SE/TWE: 560, 575	SE/TWE: 560, 575	SE/TWE: 560, 575			
9-12	2d	Students know the atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form.	SE/TWE: 489-490	SE/TWE: 490, 495	SE/TWE: 490			

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	2e	Students know how to draw Lewis dot structures.	SE/TWE: 560, 583	TWE: 583	TWE: 583			
9-12	2f*	Students know how to predict the shape of simple molecules and their polarity from Lewis dot structures.						
9-12	2g*	Students know how electronegativity and ionization energy relate to bond formation.						
9-12	2h*	Students know how to identify solids and liquids held together by Van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/melting point temperatures.	SE/TWE: 488-491	SE/TWE: 490, 491				
		Conservation of Matter and Stoichiometry The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept:						
9-12	3a	Students know how to describe chemical reactions by writing balanced equations.	SE/TWE: 743-745, 760	SE/TWE: 745, 762 TWE: 744	SE/TWE: 745, 762 TWE: 744			
9-12	3b	Students know the quantity one mole is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams.						
9-12	3c	Students know one mole equals 6.02×10^{23} particles (atoms or molecules).						
9-12	3d	Students know how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.						
9-12	3e	Students know how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses.						
9-12	3f*	Students know how to calculate percent yield in a chemical reaction.						

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	3g*	Students know how to identify reactions that involve oxidation and reduction and how to balance oxidation-reduction reactions.						
		Gases and their Properties The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept:						
9-12	4a	Students know the random motion of molecules and their collisions with a surface create the observable pressure on that surface.	SE/TWE: 502, 504	SE/TWE: 507	SE/TWE: 507			
9-12	4b	Students know the random motion of molecules explains the diffusion of gases.	SE/TWE: 490, 502, 504	SE/TWE: 507	SE/TWE: 507			
9-12	4c	Students know how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.	SE/TWE: 498-501, 502-509, 512	SE/TWE: 501, 505, 507, 514	SE/TWE: 501, 514			
9-12	4d	Students know the values and meanings of standard temperature and pressure (STP).						
9-12	4e	Students know how to convert between the Celsius and Kelvin temperature scales.	SE/TWE: 21	SE/TWE: 21	SE/TWE: 21			
9-12	4f	Students know there is no temperature lower than 0 Kelvin.	SE/TWE: 21	SE/TWE: 21	SE/TWE: 21			
9-12	4g*	Students know the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.						
9-12	4h*	Students know how to solve problems by using the ideal gas law in the form $PV = nRT$.						
9-12	4i*	Students know how to apply Dalton's law of partial pressures to describe the composition of gases and Graham's law to predict diffusion of gases.						

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
		Acids and Bases Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:						
9-12	5a	Students know the observable properties of acids, bases, and salt solutions.	SE/TWE: 766-771, 777, 790	SE/TWE: 768, 771, 775, 785, 790 TWE: 778	SE/TWE: 775, 785, 790			
9-12	5b	Students know acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.	SE/TWE: 766-771, 790	SE/TWE: 771, 776	SE/TWE: 771, 776			
9-12	5c	Students know strong acids and bases fully dissociate and weak acids and bases partially dissociate.	SE/TWE: 772-773, 790	SE/TWE: 775, 776	SE/TWE: 775, 776			
9-12	5d	Students know how to use the pH scale to characterize acid and base solutions.	SE/TWE: 774	SE/TWE: 775	SE/TWE: 775			
9-12	5e*	Students know the Arrhenius, Brønsted-Lowry, and Lewis acid–base definitions.						
9-12	5f*	Students know how to calculate pH from the hydrogen-ion concentration.						
9-12	5g*	Students know buffers stabilize pH in acid–base reactions.	SE/TWE: 775	SE/TWE: 775	SE/TWE: 775			
		Solutions Solutions are homogenous mixtures of two or more substances. As a basis for understanding this concept:						
9-12	6a	Students know the definitions of solute and solvent.	SE/TWE: 706-707, 713, 714, 715, 725, 732	SE/TWE: 707, 714, 715, 733, 734	SE/TWE: 707, 715, 733, 734, 735			
9-12	6b	Students know how to describe the dissolving process at the molecular level by using the concept of random molecular motion.	SE/TWE: 709-710	SE/TWE: 712	SE/TWE: 712			
9-12	6c	Students know temperature, pressure, and surface area affect the dissolving process.	SE/TWE: 710-712	SE/TWE: 712 TWE: 710	SE/TWE: 712 TWE: 710			
9-12	6d	Students know how to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million, and percent composition.						

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	6e*	Students know the relationship between the molality of a solute in a solution and the solution's depressed freezing point or elevated boiling point.						
9-12	6f*	Students know how molecules in a solution are separated or purified by the methods of chromatography and distillation.						
		Chemical Thermodynamics Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept:						
9-12	7a	Students know how to describe temperature and heat flow in terms of the motion of molecules (or atoms).	SE/TWE: 752-753, 760	SE/TWE:	SE/TWE:			
9-12	7b	Students know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.	SE/TWE: 752-753, 760	SE/TWE: 752, 754	SE/TWE: 752, 754			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	7c	Students know energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts.	SE/TWE: 752-753, 760	SE/TWE: 754 TWE: 753	SE/TWE: 754 TWE: 753			
9-12	7d	Students know how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change.						
9-12	7e*	Students know how to apply Hess's law to calculate enthalpy change in a reaction.						
9-12	7f*	Students know how to use the Gibbs free energy equation to determine whether a reaction would be spontaneous.						
		Reaction Rates Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. As a basis for understanding this concept:						
9-12	8a	Students know the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.	SE/TWE: 746-749, 760	SE/TWE: 748, 749	SE/TWE: 748, 749			
9-12	8b	Students know how reaction rates depend on such factors as concentration, temperature, and pressure.	SE/TWE: 750-754, 760	SE/TWE: 754, 755	SE/TWE: 754, 755			
9-12	8c	Students know the role a catalyst plays in increasing the reaction rate.	SE/TWE: 754, 755, 760	SE/TWE: 754, 755	SE/TWE: 754, 755			
9-12	8d*	Students know the definition and role of activation energy in a chemical reaction.						

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
		Chemical Equilibrium Chemical equilibrium is a dynamic process at the molecular level. As a basis for understanding this concept:						
9-12	9a	Students know how to use LeChatelier's principle to predict the effect of changes in concentration, temperature, and pressure.						
9-12	9b	Students know equilibrium is established when forward and reverse reaction rates are equal.	SE/TWE: 743-745	SE/TWE: 745	SE/TWE: 745			
9-12	9c*	Students know how to write and calculate an equilibrium constant expression for a reaction.	SE/TWE: 743-745	SE/TWE: 745	SE/TWE: 745			
		Organic Chemistry and Biochemistry The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the bio-chemical basis of life. As a basis for understanding this concept:						
9-12	10a	Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.	SE/TWE: 758-759, 638-639, 640-644, 645-648, 650-655, 656-661, 666	SE/TWE: 639, 644, 648, 649, 655, 661, 662-663, 667, 668	SE/TWE: 639, 644, 648, 649, 655, 661, -663, 667, 669			
9-12	10b	Students know the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.	SE/TWE: 650-655, 656-661, 666	SE/TWE: 655, 661, 662-663, 667, 668	SE/TWE: 665, 661, 663, 667, 669			
9-12	10c	Students know amino acids are the building blocks of proteins.	SE/TWE: 656-657, 666	SE/TWE: 657, 661	SE/TWE: 657, 661			

* For more information, see Notes.

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	10d*	Students know the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds, and simple molecules that contain a benzene ring.						
9-12	10e*	Students know how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids.						
9-12	10f*	Students know the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins.						
		Nuclear Processes Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept:						
9-12	11a	Students know protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons.	SE/TWE: 258-262, 284	SE/TWE: 262, 284	SE/TWE: 262, 284			
9-12	11b	Students know the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E = mc^2$) is small but significant in nuclear reactions.	SE/TWE: 273-278, 284	SE/TWE: 274, 278, 279, 280-281	SE/TWE: 278, 279, 281			
9-12	11c	Students know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.	SE/TWE: 260-262, 267	SE/TWE: 262	SE/TWE: 262			
9-12	11d	Students know the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.	SE/TWE: 263-265	SE/TWE: 267	SE/TWE: 267			
9-12	11e	Students know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.	SE/TWE: 263-264, 265, 284	SE/TWE: 267	SE/TWE: 267			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	11f*	Students know how to calculate the amount of a radioactive substance remaining after an integral number of half lives have passed.	SE/TWE: 266, 284	SE/TWE: 267	SE/TWE: 267			
9-12	11g*	Students know protons and neutrons have substructures and consist of particles called quarks.	SE/TWE: 545-546, 568	SE/TWE: 545, 549	SE/TWE: 545, 549			
DISCIPLINE		**INVESTIGATION AND EXPERIMENTATION** Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:	SE/TWE: 7, 25, 28-29, 57-58, 81, 99, 112, 116-117, 216-217, 231, 451, 455, 458, 467, 474-475, 480, 506, 534-535, 594-595, 607, 621, 630-631, 643, 715, 756, 781	SE/TWE: 25, 28-29, 57-58, 81, 99, 112, 116-117, 216-217, 231, 451, 455, 458, 467, 474-475, 480, 506, 534-535, 594-595, 607, 621, 630-631, 643, 715, 756, 781	SE/TWE: 25, 29, 58, 81, 99, 112, 117, 217, 231, 451, 455, 458, 467, 475, 480, 506, 535, 595, 607, 621, 631, 643, 715, 756, 781			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	1a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.	SE/TWE: 7, 8, 27, 28-29, 57, 58-59, 89, 90-91, 106, 116-117, 147, 148-149, 171, 180-181, 208, 216-217, 247, 248-249, 279, 280-281, 311, 312-313, 338, 348-349, 374, 380-381, 402, 410-411, 441, 442-443, 459, 474-475, 496, 508-509, 525, 534-535, 563, 564-565, 579, 594-595, 621, 630-631, 649, 662-663, 691, 692-	SE/TWE: 27, 28-29, 57, 58-59, 89, 90-91, 106, 116-117, 147, 148-149, 171, 180-181, 208, 216-217, 247, 248-249, 279, 280-281, 311, 312-313, 338, 348-349, 374, 380-381, 402, 410-411, 441, 442-443, 459, 474-475, 496, 508-509, 525, 534-535, 563, 564-565, 579, 594-595, 621, 630-631, 649, 662-663, 691, 692-	SE/TWE: 27, 29, 57, 59, 89, 91, 106, 117, 147, 149, 171, 181, 208, 217, 247, 249, 279, 281, 311, 313, 338, 349, 374, 381, 402, 411, 441, 443, 459, 475, 496, 509, 525, 535, 563, 565, 579, 595, 621, 631, 649, 663, 691, 693, 727, 729, 755, 757, 776, 787			
9-12	1b	Identify and communicate sources of unavoidable experimental error.	SE/TWE: 7-10	SE/TWE: 13, 171 TWE: 20	SE/TWE: 13, 171 TWE: 20			
9-12	1c	Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	SE/TWE: 7-10, 28-29, 58-59	SE/TWE: 13, 21, 29, 34, 59	SE/TWE: 29, 59			

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	1d	Formulate explanations by using logic and evidence.	SE/TWE: 7, 10, 25, 28-29, 57-58, 81, 99, 112, 116-117, 216-217, 231, 451, 455, 458, 467, 474-475, 480, 506, 534-535, 594-595, 607, 621, 630-631, 643, 715, 756, 781	SE/TWE: 13, 25, 28-29, 57-58, 81, 99, 112, 116-117, 216-217, 231, 451, 455, 458, 467, 474-475, 480, 506, 534-535, 594-595, 607, 621, 630-631, 643, 715, 756, 781	SE/TWE: 13, 25, 29, 58, 81, 99, 112, 117, 217, 231, 451, 455, 458, 467, 475, 480, 506, 535, 595, 607, 621, 631, 643, 715, 756, 781			
9-12	1e	Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.	SE/TWE: 42, 69, 104, 128, 130, 162, 214, 246, 270, 335, 378, 499, 505, 531, 625, 711, 748, 749, 785, 816-825	SE/TWE: 42, 69, 104, 128, 130, 162, 214, 246, 267, 270, 335, 378, 499, 505, 531, 625, 711, 748, 749, 785	SE/TWE: 42, 69, 104, 128, 130, 162, 214, 246, 267, 270, 335, 378, 499, 505, 531, 625, 711, 748, 749, 785			
9-12	1f	Distinguish between hypothesis and theory as scientific terms.	SE/TWE: 8, 10, 12, 199, 273, 290, 488, 544, 802	SE/TWE: 13, 199, 273, 290, 488, 544 TWE: 12	SE/TWE: 13, 199, 273, 290, 488, 544			
9-12	1g	Recognize the usefulness and limitations of models and theories as scientific representations of reality.	SE/TWE: 11, 12, 474-475	SE/TWE: 13, 31, 280-281, 475 TWE: 642	SE/TWE: 13, 31, 281, 475 TWE: 642			
9-12	1h	Read and interpret topographic and geologic maps.	SE/TWE: 331	SE/TWE: 331				

			PUBLISHER CITATIONS**			FOR LEA USE ONLY		
						Meets Standard		
Grade	Standard #	Text of Standard	Introduced	Practiced	Taught to Mastery	Y	N	Local Education Agency Evaluator Notes
9-12	1i	Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).	SE/TWE: 266-267, 270, 800	SE/TWE: 270	SE/TWE: 270			
9-12	1j	Recognize the issues of statistical variability and the need for controlled tests.	SE/TWE: 9, 22	SE/TWE: 9	SE/TWE: 9			
9-12	1k	Recognize the cumulative nature of scientific evidence.	SE/TWE: 544-549, 554-562, 658-659	SE/TWE: 545, 547, 548, 562	SE/TWE: 549, 562			
9-12	1l	Analyze situations and solve problems that require combining and applying concepts from more than one area of science.	SE/TWE: 199, 250-251	SE/TWE: 251 TWE: 199	SE/TWE: 251 TWE: 199			
9-12	1m	Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.	SE/TWE: 150-151, 314-315, 412-413, 476-477, 788-789	SE/TWE: 151, 276, 278, 315 TWE: 413, 477	SE/TWE: 151, 315 TWE: 276, 278, 413, 477			
9-12	1n	Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).	SE/TWE: 282-283, 547-549 TWE: 61, 266	SE/TWE: 549 TWE: 61, 548	SE/TWE: 549 TWE: 548			